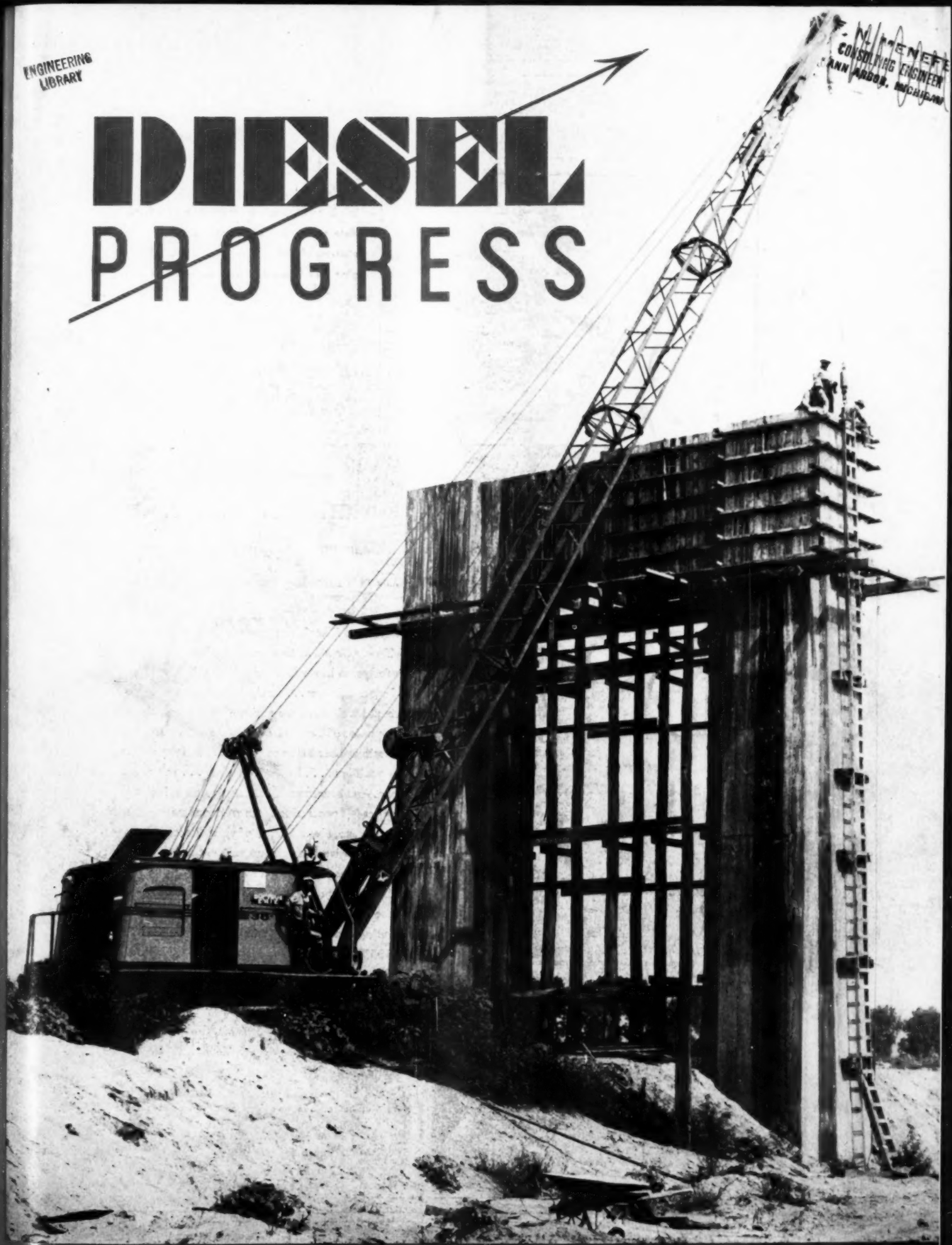
DIESEL PROGRESS



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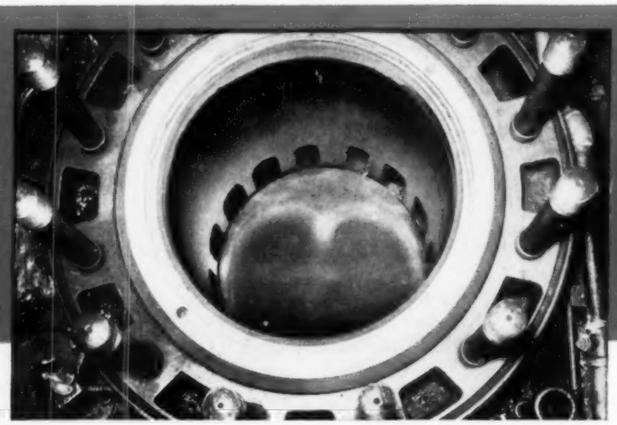

Looking down into cylinder of a Diesel that has been run 11,000 hours under 90% load. Note scavenging ports are still clear. Note absence of deposits on piston head. This engine was lubricated with *Texaco Ursa Oil.*

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DIESEL and GAS ENGINE PROGRESS

N INDUSTRY • IN TRANSPORTATION • ON THE SEA • IN THE AIR

CONTENTS

NOVEMBER 1948

FRONT COVER ILLUSTRATION: Near Kansas City a Bucyrus-Erie dragline spots heavy steel members for Liberty Bridge which will eliminate a six and a half mile bend in the Missouri River. Dragline is powered by a 6 cylinder General Motors diesel engine. Fuel consumption is 50 gallons for each 40 hours of operation at 1400 rpm.

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SOCONY 10... NEW 1000 HP. DIESEL TUG

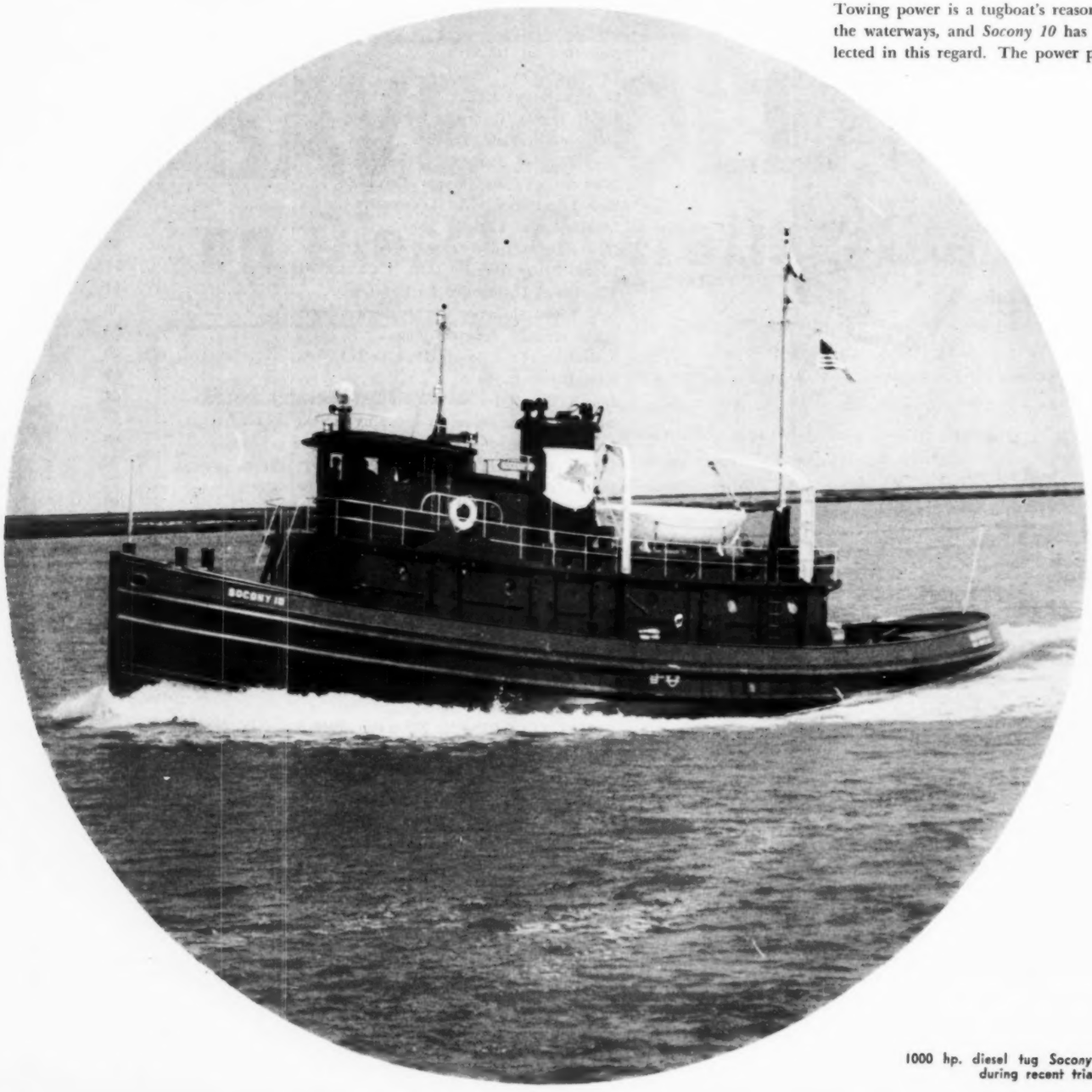
By WILL H. FULLERTON

ON THE Atlantic coast, the Socony-Vacuum house flag is well known and flies over well-found boats, used principally in New York harbor, Long Island Sound, the Hudson River and coastwise between Philadelphia and New York. And this fleet is in for a complete program of modernizing. Part of the program will be remodeling and conversion. Two of the Socony-Vacuum tugs are steam vessels, with engines of around 600 hp.; these two tugs will be converted to diesel, with installation of engines of 1,000 hp., and this work is due to start about the first of next January.

New construction also has its part in this fleet rehabilitation program, with one new all-steel tug just delivered to the company. And in line with the program, which not only increases the fleet's total horsepower but also plans that no individual tug will have less than 900 hp., this new vessel will have 1,000 hp. at the shaft. The overall length of *Socony 10* is 102 ft. 4 in.; beam 24 ft. 0 in., draft moulded 10 ft. 1. She was sold by General Motors and built to G.M. specifications by a well-known Port Arthur, Texas, yard.

Socony 10 is a big boat; she has quarters for a crew of 11, and these quarters with their more than adequate ventilation, lighting and all-around attractiveness would grace any millionaire's yacht you ever saw.

Towing power is a tugboat's reason for being on the waterways, and *Socony 10* has not been neglected in this regard. The power plant is a Gen-



1000 hp. diesel tug *Socony 10* underway during recent trials.

eral Motors diesel, made by the G-M Cleveland Diesel Engine Division. This is a two-cycle machine, model 12-278-A, V-type, with 12 cylinders, 8¾ in. bore with a stroke of 10½ in. Horsepower is rated at 1200 at 750 rpm. It is fitted with Satco and "Tri-Metal" bearings.

This engine is fitted with a Falk Airflex reversing-reduction unit, approximately 3:1 ratio; reducing the engine rpm. of 748 to 252 at the propeller, to be exact; the clutch is actuated by the well-known "rubber tire," with a clutch air tank carrying 150 lbs. per sq. in. working pressure. Engine starting is also by compressed air, supplied by two air tanks each 7 ft. in length with a 15 in. inside diameter and a working pressure of 400 psi.

Cooling is closed circuit, using a Ross heat exchanger; another Ross exchanger cools the engine lube oil. Governor is Marquette, with an Allis-Chalmers 120 volt motor. Pyrometer is Brown. Lube oil filter is a Briggs Clarifier, cartridge type. Air compressors for engine starting are Ingersoll-Rand, one to port and one to starboard, both driven by B. A. Wesche Electric Co. motors of 40 amps., 115 volts. d.c. The lube oil pressure pump is a Viking, 40 gpm. at 45 psi.

The boat carries two diesel auxiliary generating units, one to port and one to starboard, these are 30 kw., General Electric generators, 120 volts d.c., driven by 3-cylinder General Motors diesels, Series 71, rated for this service at 45 hp. at 1200 rpm. A U. S. Motors 2 kw. emergency generating set is also installed. The battery set is Exide, 56 cells, 213 ampere hour. Auxiliary diesel starting is electric; cooling is by a Harrison heat exchanger for each engine; governors are Woodward; fuel and lube filters, and also the air cleaner, is A.C. make, regulator Detroit Diesel G-M equipment. Purolator lube oil purifiers are included. Silencers are Vortex Syncro, as on the main engine.

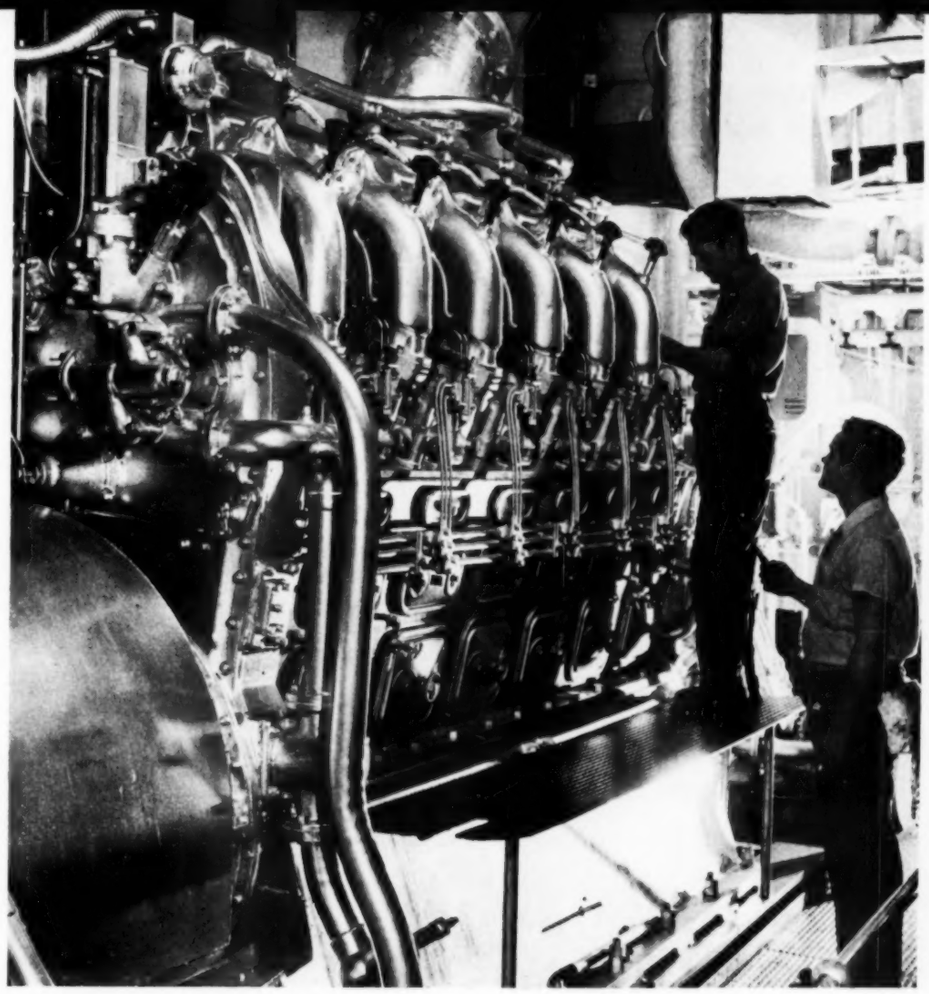
The main diesel turns a big wheel, a Ferguson right hand 3-blade, 8 ft. diameter, 5 ft. pitch, made of bronze; the fairweather cap is also of Ferguson make. The intermediate shaft is 9⅞ in. diameter, 6 ft. 11/16 in. long; the tail shaft is also 9⅞ in., 21 ft. 10 in. long.

Steering is by a Steeromotor unit, from Almon A. Johnson, Inc., with forward and after steering control stands. Almon A. Johnson also supplied the gypsey capstan unit.

The main engine room blower is from the American Blower Corporation, as is the quarters blower; E. J. Willis Co. manufactured the galley blower. The galley range is from Elisha Webb & Son; the fuel oil galley tank and hand pump are also Webb products.

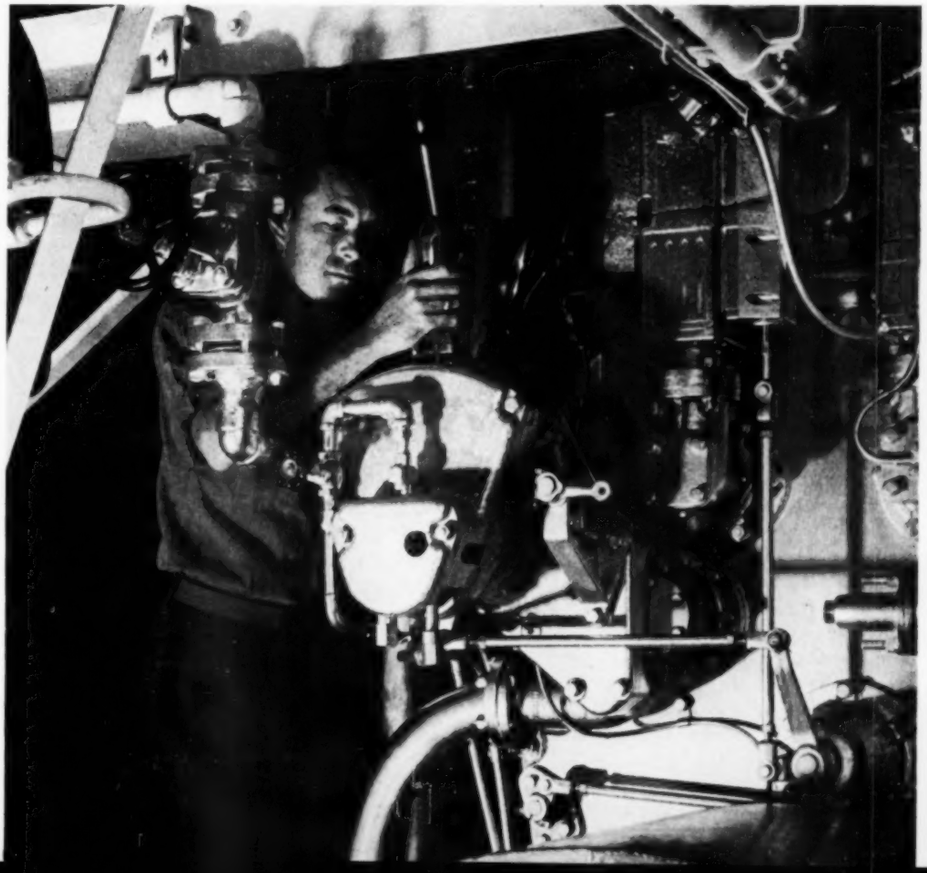
On the sea trials held at Port Arthur, Texas, according to the builders, the tug made 11.6 knots on a measured mile course, developing 1,000 shaft horsepower at 250 rpm., using the 8 ft. by 5 ft. propeller before mentioned.

The cost of this new vessel is said to be slightly over $300,000; following the trials and acceptance, the vessel left for New York, to go into Socony-Vacuum service immediately.



Engineers make minor adjustments on big 12 cylinder GM Cleveland diesel aboard *Socony 10*.

View of engine control equipment aboard *Socony 10*. Marquette governor is seen upper right.



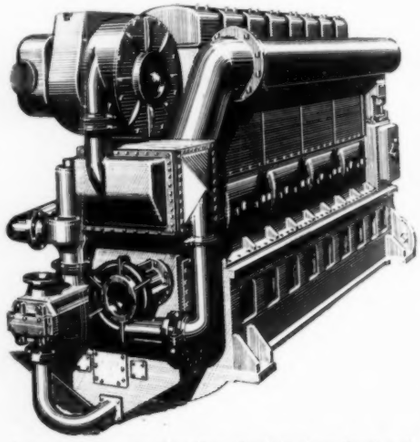
DETAILS OF 9x12 LIMA-HAMILTON DIESEL

By REX W. WADMAN

HERE is a new diesel engine designed to take its place with engines rated up to 1200 hp., but featuring the advantages of higher than average working pressures and intercooled turbocharging. Lima-Hamilton Corporation recently announced this new line of 9″ x 12″ diesels in 6 and 8 cyl. models to be built by its Hooven, Owens, Rentschler Company Division at Hamilton, Ohio. Offered as turbocharged units or naturally aspirated, these Hamilton diesels may be applied to stationary electric or straight mechanical power generation, marine propulsion and railroad use.

The basic engine is of vertical, single acting, four stroke cycle design, the 8 cyl. model having a turbocharged rating of 1200 hp. at 950 rpm. Now let's take the engine apart and look at it.

Cylinder block is of unusually rugged welded steel construction and is furnace stress relieved with individual, wet type cylinder liners of wear resistant cast iron. *Liners* are sealed at the bottom with two synthetic rubber rings with a groove between them which is provided with an outlet to the outside to detect water leaks. Jumpers are used between the cylinder block and cylinder head to prevent leakage of cooling water.



Outwardly the new Hamilton diesel is clean lined and functionally arranged.

Cylinder heads are Meehanite cast iron, fitted with two each, exhaust valves and intake valves, and one injection nozzle. All moving parts are enclosed for protection.

Base is extremely rugged welded steel construction, and is furnace stress relieved. For locomotive application, the generator is bolted directly to the base and through an adapter to the engine block for additional rigidity.

Crankshaft is drop forged alloy steel, heat treated. It is counter weighted and fitted at the forward end with a Houde oil viscous vibration damper to eliminate torsionals.

Main bearings are precision type with top bearing caps held in place by jack bolts. Main bearings may be removed through the cylinder block crank pit cover without disturbing the crankshaft.

Camshaft is mounted in line-bored bearing fits in the cylinder block and is gear-driven from the generator end of the engine. Cams are integral with the shaft.

Pistons are forged aluminum, oil-cooled through the connecting rod and are fitted with four compression rings and three oil control rings.

Connecting rods are die-forged alloy steel of two-piece type with rifle drilled oil passages. Rods may be removed without removing cylinder liners.

Wrist pins are full floating type carried on bronze bushings in the eye of the connecting rods. Lube oil is carried through drilled connecting rods, thence through the wrist pins to cool the pistons.

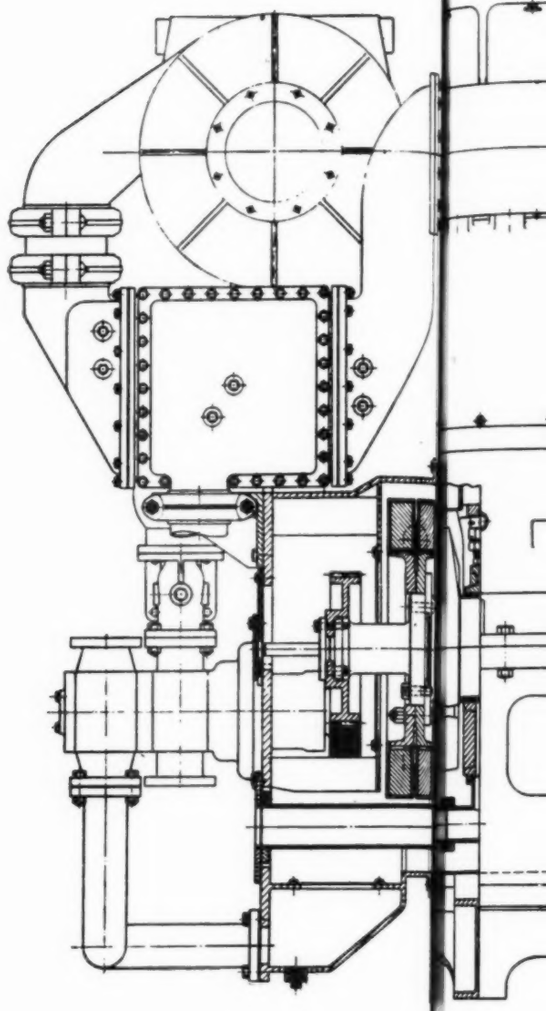
Fuel injection is of individual pump type with the pumps mounted on the cylinder block. Leakage from pumps and nozzles is collected and returned to main supply tank. A motor-driven fuel oil booster pump is provided. Adeco fuel injection pumps are supplied.

Lubrication is provided by a 180 gpm. pressure pump through strainers to the header. A scavenging pump circulates oil from the oil pan through filters and coolers to the lube oil tank.

Governor is Woodward hydraulic type.

Turbocharger is Elliott-Buchi and is mounted on the free end of the engine with lube supplied from the engine lubricating system. The turbocharger operates at considerably elevated pressures—is especially designed for the high pressure operating conditions of the engine.

Water pump is centrifugal-type, 500 gpm., gear driven, arranged so pump and drive can be removed as a unit for inspection.



Longitudinal
new Lima-Ha
dies

Of particular interest to the diesel engine field is the intercooling provided on all supercharged models. Inclusion of the intercooler, together with a high specific output of the engine, and other features, enable the new Hamilton diesel to meet competition in its field.

Considering the output of these engines, their dimensions are interesting, the six-cylinder engine being 11′ 2¼″ long, the eight-cylinder engine being 13′ 5¼″ long; both engines having an overall height of 6′ 7¼″ and width of 4′ 3½″. Clearance height for removing pistons is 7′ 10½″.

This new line of Hamilton, 4-cycle diesels emphasizes a clean-cut outward appearance and ruggedness in construction. The design bespeaks special attention to minimization of maintenance and to simplification of repairs when necessary. It is a nice-looking, well-proportioned job inside and out—modern is the word!

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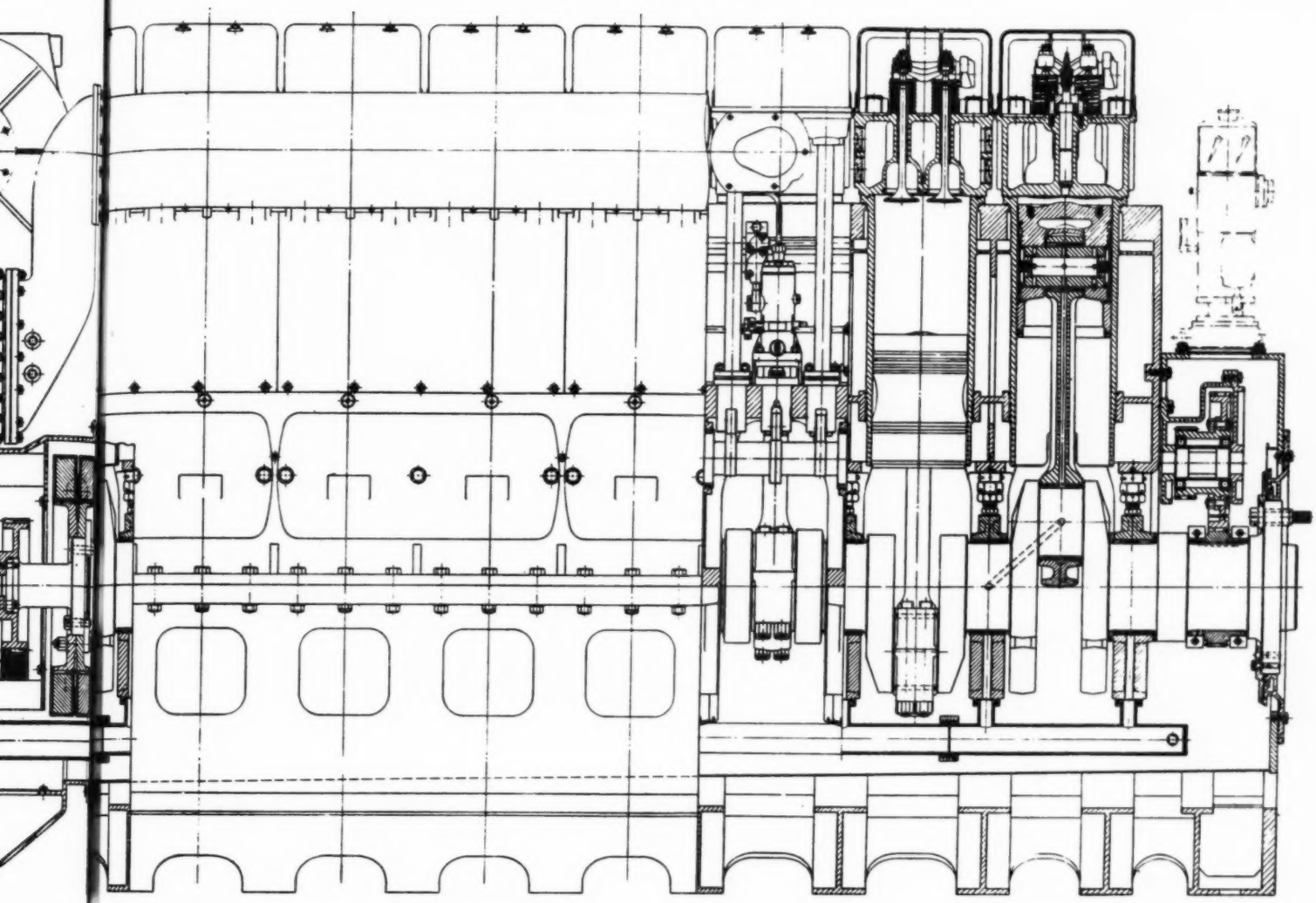
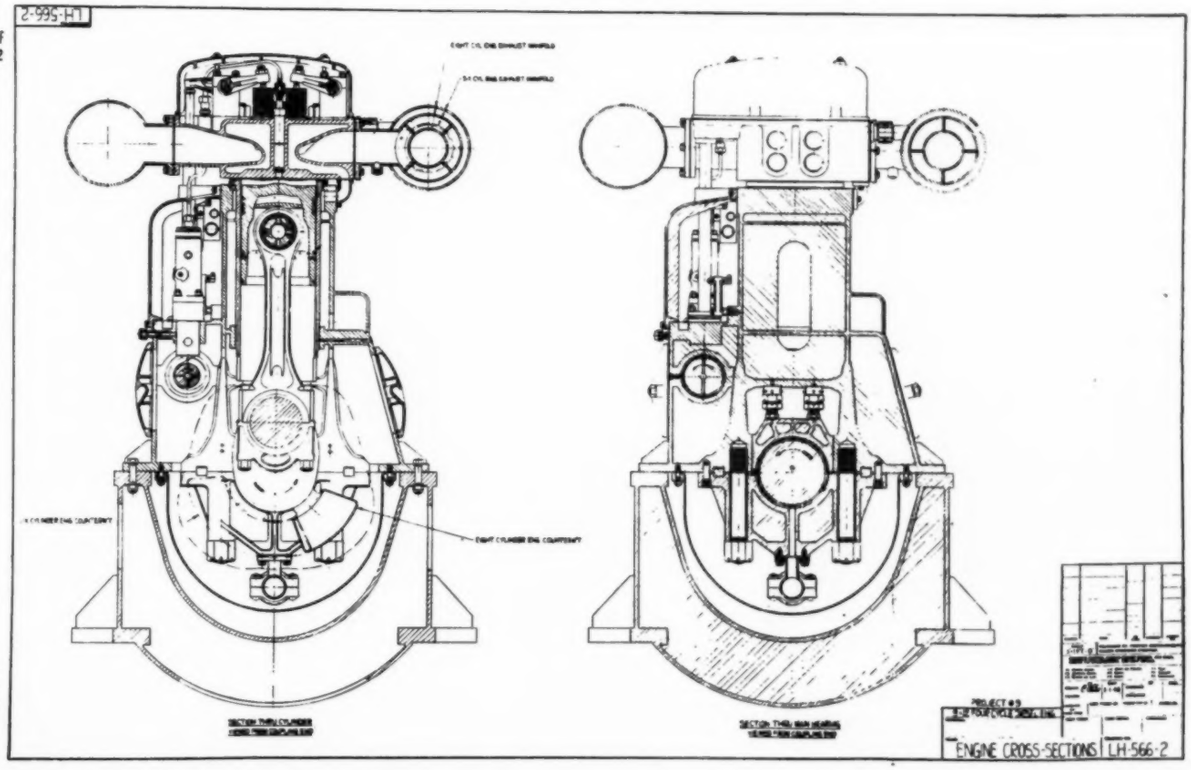


Longitudinal section of new Lima-Hamilton 9x12 diesel.



Transverse section of the same engine showing compact arrangement yet easy access for maintenance.

Equipped with brush armor, "Caterpillar" diesel readies land for brushland plow.

FOREST SERVICE ENGINEERS DEVELOP RUGGED NEW EQUIPMENT

By F. HAL HIGGINS

"TED" FLYNN, that rugged and durable Five-by-Five Irishman who has risen from the ranks to the top in U. S. Forest Service equipment engineering, is ready with a new implement that meets a need. It is a stump-jump one-way disk plow that will dig out the sage brush for a clean-up of the 100,000,000 acres of brush covered lands of the West that are needed for grass growing for beef and lamb production.

The writer recalls Mr. Flynn as a short, wide lad with more practical machine know-how than any other man in the U. S. Government he has ever encountered. Flynn was noted about twenty years ago at the first school of the U. S. Forest Service engineers in the Santa Barbara National Forest in southern California. Each of the districts sent its engineers out to this school to learn what the chunky Irishman from Portland had been doing with tractors, road graders, bulldozers, etc. Caterpillar Tractor Company sent a crew of engineers to demonstrate its crawler tractors and road graders, and some equipment of the latest bulldozer and side casting type with which Flynn was beginning to revolutionize forest fire fighting by building rapidly cheap roads over which men and equipment could move fast in time to get to the fire before it got out of control. The visiting forestry engineers were impressed to the point of immediately putting in motion programs of mechanization in their own districts.

Flynn returned to Portland and continued working out the mechanization answers to the Portland district's forest service problems. His "snowmobile" for high altitude winter travel was one we heard of some 10 years ago. In the meantime, the fire fighters of the U. S. Forest Service had begun to use airplanes to parachute men and equipment to the forest fire areas, and Flynn's airborne tractor with bulldozer and winch were just ready for action when war broke and the air-minded army took a look at Flynn and his flying tractor and ordered them back to Michigan where the Oregon U. S. F. S. man was made advisor in a factory that turned out some 10,000 to 15,000 of these flying tractors for operations in the Pacific.

Back in 1944, Flynn sent out of his little shop on the banks of the Willamette his "Tomcat Log Tractor," a very rugged and compact crawler that carried its load of logs piggy-back to harvest about 50% more logs per trip than tractors of equal power up to that time. This U. S. F. S. logging tractor was put out on Simpson Logging Company operations near Shelton, Washington, where it encountered a wringing wet climate that averages around 100 inches of rainfall annually. Keep your eye on the logging industry as the competition gets hot, for this Flynn piggy-back tractor might come roaring out to change the design of logging tractors. It comes from a super know-how source.

So, when the writer was in Portland for the annual convention of the American Society of Agricultural Engineers last June, he took one afternoon off to drive out to the U. S. Forest Service laboratory along the west bank of the Willamette River on the south edge of town and call on Mr. Flynn. It was a lucky day, for Flynn was just bubbling over with news and pride about the success of a new mechanical baby that was beginning to talk of cleaning up the 100,000,000 acres of brush-covered lands in the vast mountain and inter-mountain stretches from the Rockies to

the west foothills of the Sierras. It was creating so much interest, the writer found, that at least two men who had flown in from Hawaii the day before had a date to meet Flynn and look over the new one-way brushland plow he had designed and built for the Forest Service to solve a problem that had licked every type of conventional and unconventional equipment to date. Now, it seems the U. S. meat consumer can look forward to getting a lot more beefsteaks and lamb chops with the quick changing of brush lands to pastures for at least 100,000,000 more acres of cattle and sheep pastures.

But let Mr. T. P. Flynn, Equipment Engineer, North Pacific Region, U. S. Forest Service, tell the story of this diesel-hauled heavy duty brushland one-way disk plow as he has designed and built it to do a big job:

"A typical and average picture in the stock country is cattle or sheep grazing where they find their feed in the forest reserves, or in the high mountains during the summer, returning to the farmer feed lots in the late fall or early winter. In between the mountain feed and the farmer's feed lot, is a long expanse of sagebrush land doing no good and through which these animals travel between feed grounds.

"It is estimated there are approximately 100 million acres of sagebrush in Utah, Nevada and Idaho that could be converted to growing suitable hay and pasture grasses such as crested wheat and others. The change-over process is relatively simple and consists of pulling a very heavy implement, or a pair of implements, behind a powerful diesel crawler tractor through the sagebrush, mashing it down or gouging it out to as near a 100% kill or eradication as possible.

"The most popular eradication implements used in the past are the largest wheatland plow that might be available from commercial sources and for extremely rocky ground, and an implement developed by the Forest Service Range Research men known as the heavy pipe harrow drag. These two implements are the most effective. The heavy wheatland disc plow, however, is generally the most popular because of the greater percentage of kill that it can accomplish compared to other trail-behind implements. When working on rough ground the structural failures on conventional single axle wheatland type plows are so great that the expense of upkeep and maintenance could not be tolerated because of its reflection on the acre cost.

"Range Research and Forest mechanical engineers recognized sometime ago that a large majority of the shortcomings in conventional single axle plows could be overcome with a plow designed first of all to provide sturdy superstructure throughout, a higher grade of materials wherever castings were used, and elimination of highly concentrated loads on individual discs, a plan using individually-sprung discs, or at least a pair of discs sprung individually, where these individual discs could spring or raise over obstacles independently of the other discs, that the above combination could reduce the excessively high breakage and maintenance costs, and probably produce much greater efficiency in eradication.

"After a quite complete survey of the situation with implement manufacturers as to the possibilities of having a super type plow developed it was evident that the U. S. Forest Service would have to roll its own in order to improve the plow situation at any early date. A highly competent committee of Range Research men under the leadership of Joseph Pehanec of the USFS Northwest Pacific Experiment Station, working with the Forest Service Division of Engineerings Equipment Development Laboratory, which is under the leadership of T. P. Flynn, Equipment Engineer, a general plan and minimum requirements were agreed upon and the Equipment Development Laboratory proceeded to make a complete overall design. From this design the first pilot model of the new U. S. Forestry Special sprung-type plow was constructed at the Forest Service shops in Portland, and put to work near Boise, Idaho, during the latter part of May, 1948.

"This new super brushland plow was unusually successful right from the start and continued tests in extremely rough going have proved that it had all and even more of the durability and strength that we hoped. Even when operating on the roughest ground surfaces it was observed that the new brushland plow can consistently and at all times maintain an eradication average of nearly 100%. For the first time in the history of rangeland plows we do find when following along the path of this new plow that all sagebrush has been completely removed and destroyed to as near 100% as anyone could measure.

"The new U. S. Forestry Special plow weighs 6500 lbs. It is equipped with 7 pairs of sprung discs, or a total of 14 discs in operation. This machine equipped with high quality anti-friction bearings throughout requires a draw-bar pull of between 4000 and 4600 lbs. for all average going, including medium steep upgrades.

"The brushland plow actually pulls easier than some of the larger conventional plows and can be towed easily with a tractor equal to Caterpillar's D-4 or International's TD-9. If greater speed in the top gears is required it can be towed with still greater ease with the next larger size crawler tractor. In order to get greater coverage for the same amount of tractor travel, it is anticipated that in the future these new plows will be pulled two abreast on some operations.

"The U. S. F. S. is proceeding as rapidly as possible on a program of building eight more machines which will be available for field use sometime late this summer. Even though the Forest Service is entirely satisfied that the new plow has already proven itself quite superior to the conventional plows used for this purpose, in the interest of the public the general policy regarding manufacturing for public use will be along the lines of holding back any promotion work until our fleet of eight machines now under construction are in the field and all possible defects are discovered and eliminated. However, I should make the picture clear that even after a large amount of extra severe testing, up to now, there are no known defects."

"Tom Cat" logging tractor developed by Forest Service engineers lugs logs on its back. It's diesel.

Unique stump-jump disc plow hauled by an International TD-9 undergoes a rugged test in Idaho.

DIESELS HAUL DRILLING EQUIPMENT

By FRED M. BURT

AS THE driller said, "All you do is turn the key, walk in and start making a hole." That is the reason oil men call them "turn-key" jobs; the latest and most advanced method of drilling particularly suitable for "wild-catting." It is simple but it calls for "unitized equipment" which means a complete rotary rig, drawworks, crown block, mud pumps, engine, even hand tools moved in one operation to the drilling location.

Four of the longest hauls of the "turn-key" well drilling equipment, starting the first one in February 1948, have recently been completed by the Arrowhead Freight Lines, a subsidiary of Asbury Transportation Company of Los Angeles. Three of these jobs, to be described herein, have been something really special, culminating from years of experience in oil field equipment hauling. The San Joaquin Drilling Co. asked the Arrowhead-Asbury, vice president-general manager, Albert J. Euyraud how long it would take to deliver a complete rotary rig from their yards in Bakersfield and the National Supply Company plant in Torrance, Cal., to Church Butte, Wyo.

"Four day delivery," was the reply.

The rig was for the first major drilling operation in this extensive new field. The Church Butte, well at about 7,000 feet elevation, on the western slope of the Continental Divide, about 70 miles east of Green River, Wyoming may tax the capacity of the National Supply #125 drawworks, which can be used to drill holes up to about 15,000 feet deep. (The four Superior Model PTD diesel field engines used to power the drilling job were shipped from the National Supply Co.'s Springfield, Ohio plant to Granger, Wyoming and then hauled to the field by the Mountain Fuel Trucking Co.)

The haul called for over 900 miles of highway and 20 miles of off-highway transport; total weight to be moved, over 400,000 lbs.; largest single chunk of load, over 20 tons. The temperature range was from 60-65° in California, to 32° below. The convoy of 11 trucks and tractors, trailers and semis, left Torrance and Bakersfield very early on this February Monday morning. They met at the Shell Super Truck Stop at Barstow, California where the two sections joined at about midnight, and were refueled.

Tractors and trucks were—five Kenworths powered with four Cummins diesels, and one 275-hp. super-charged Buda: two Macks with 200-hp. Cummins diesels and two Macks with Cummins 150-hp. diesels. These nine units were supplemented with two Kenworths having Hall-Scott, 400 series, gasoline engines. Three trucks with nine ton loads pulled 24-ft. Freuhauf trailers with 12 ton cargoes; the eight tractors pulled 35-ft. Fruehauf semis with weight-limit loads easily. Eleven drivers made the trip, accompanied by the company's Operations Manager, Warren Bruckner in his own car, to give supervision.

Leaving Barstow at 6 A.M. Tuesday, the 310 mile trip to Cedar City, Utah was made in 11 hours. The trucks were serviced, and on Wednesday the 285 mile run to Salt Lake City required 9 hours. Leaving there at 1 A.M. Thursday, the 250 mile last leg was completed by 8 A.M.

The unloading completed Thursday, engines were kept running to prevent freezing in the sub-zero weather, until starting back on Friday to reach Los Angeles on Monday. No engine or other equipment troubles were encountered. Arrowhead took it in its stride. It was just another job. Today's modern equipment handled a project with ease, that would have been impracticable ten years ago.

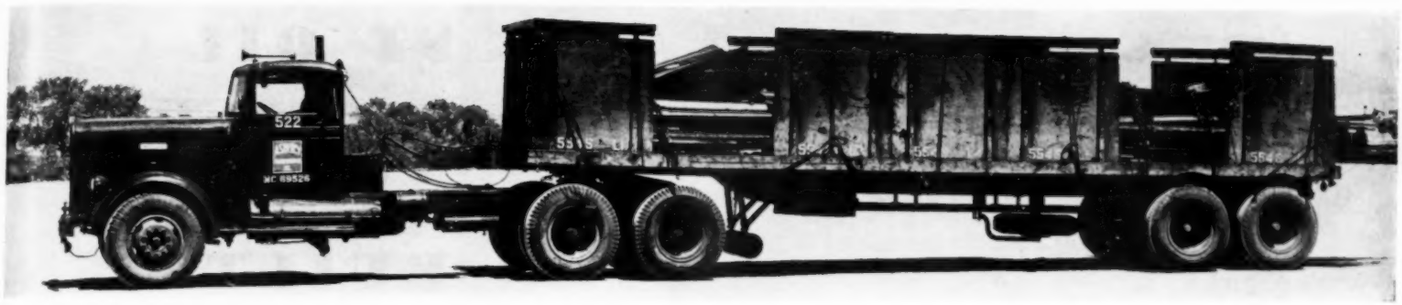
At the well site, the drawworks and derrick were transferred from trucks and trailers to the base with the aid of lines and winches, utilizing the power from the big truck engines.

A little later, a similar hauling job for Loffland Bros. Drilling Co. of Bakersfield, 900 miles to another new oil field at Green River, Utah, was handled with two groups of movement from Long Beach, Calif. and Bakersfield. The first six loads were handled with four Kenworth trucks with Cummins diesels, and four Kenworths with Hall-Scotts. Two days later the second convoy followed: six loads using six Kenworths powered with two 275-hp. Buda diesels, two Cummins and two Hall-Scotts. Again a quick delivery with n troubles, although the last 4½ miles was o highway, on a very rough road with steep grad and limited unloading space.

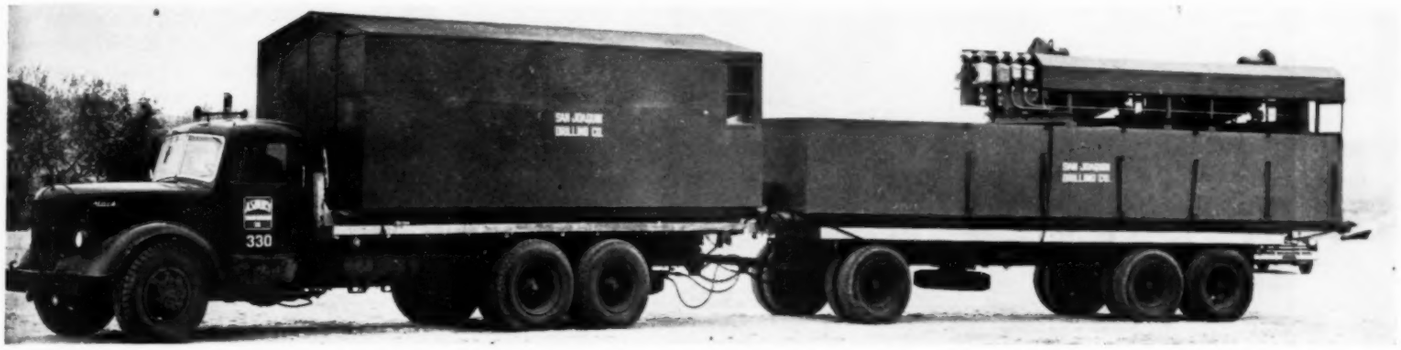
The third job was kind of a combination affai but was carefully planned to save a lot of mileag without payloads. Thirty, weight-limit, truck an trailer and semi-trailer loads of drilling equipmen were involved. Of these, 22 for the San Joaqui Drilling Company comprised what was probabl the biggest single moving job of its kind eve undertaken in the far West.

Fourteen carrier units took off for Price, Utah 820 miles away at 8500 ft. elevation, 21 miles o highway in the Pacific Western Oil Co. field After 14 miles of dirt road, the last seven mile was on a stretch of the oil company's road cu out of the mountain side at a cost of $10,000 pe mile, requiring 1¾ hrs. of slow travel. Eight o the units were Diesel—five Kenworth tractors wit Cummins engines hauling 35-ft semis; three Mac trucks and trailers—also Cummins-engined. Th other six were gas jobs. Picking up loads fo Bakersfield, delivery was quickly made, then th eight Diesel units went back to Price to re-loa with Pacific Western drilling equipment. Thi was hauled to Thompson, Utah, 120 miles farthe east. Then the equipment went back to Price fo eight loads to Bakersfield and other Southern Cali fornia points for the San Joaquin company.

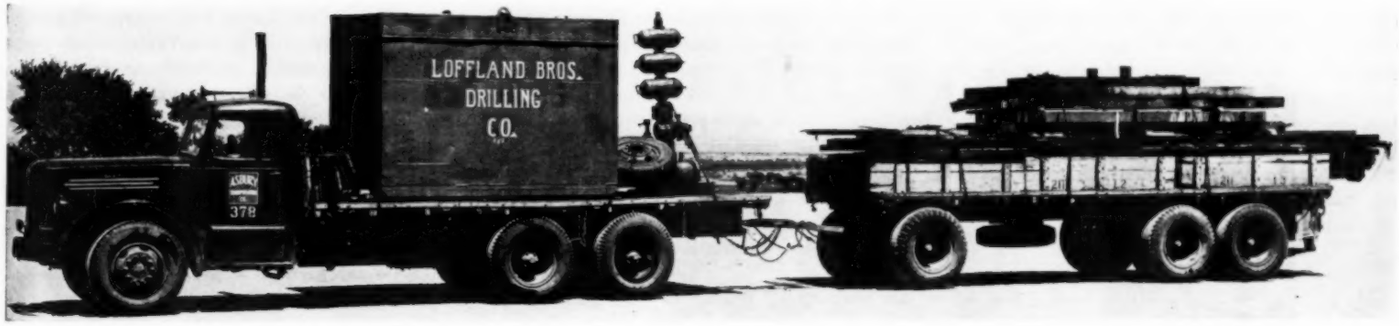
The most important diesel fact proved by thes four operations, was that the Kenworth and Mack Cummins and Buda, diesel-powered, tractors an trucks, functioned perfectly throughout; and an difficulties encountered were not caused by th power equipment.



Kenworth tractor powered with 275 hp. supercharged Buda diesel with 38,000 lb. load en route to Church Buttes, Wyoming.



Mack, Cummins-engined truck and trailer with 20-ton load of oil well drilling equipment for Church Buttes.



Another Mack, powered with Cummins diesel en route to Green River, Utah.

Arrowhead Transportation Co.'s convoy of diesel trucks with 400 tons of "unitized" drilling equipment at Barstow rendevous.

LARGEST OIL FIELD TRUCK EVER BUILT

By DOUGLAS SHEARING

THREE Mack Model LRSW oilfield trucks, the largest standard production motor vehicles ever built, have just been delivered to the Gulf Oil Company by Mack Trucks, Inc. Gulf will use these huge off-highway six-wheelers on oil field development operations in Venezuela.

Designed specifically for hauling tremendous loads off-the-road, the LRSW has a gross-vehicle-weight rating of 115,000 lbs. and a wheelbase of 247-62 in. The frame is electrically fused into a single massive piece capable of carrying great loads and withstanding tremendous shock. Huge alloy steel I-beam side-members are reinforced and joined by five cross-members. The trunnion cross-member is well gusseted to the siderails. Torsional rigidity and beam strength are high.

The LRSW mounts an oil field platform body built by the Truck Equipment Company of Norwalk, Conn. Its load platform is 18 ft., 6 in. long. The body floor is four in. oak, covered with 5/16 in. steel deck plate for its entire length. Gin poles, A-frame and rolling tail pipe are included in the body equipment. A Tulsa Model 80 winch of 65,000 lb. capacity is conventionally mounted behind the cab.

Power for the huge truck is supplied by a 6 cylinder 275 hp., 2100 rpm. Cummins supercharged diesel engine. A two-plate air-assist clutch relieves driver fatigue and puts the engine to work through a massive five-speed Mack transmission and a three-speed Brown-Lipe auxiliary. This combination of main and auxiliary transmissions provides a total of 15 forward speeds in ideal progression to meet the demands of all grade and terrain conditions. A tower type power take-off, which drives the winch, mounts directly on the auxiliary box.

According to oil company field engineers, these trucks undergo the most gruelling service imaginable. In Columbia and Venezuela where they are used, roads are practically non existant. They operate in open country in the oil fields. As for the loads carried, they are tremendous. Model LM Macks outfitted by TECO are rated for a 40 ton load as against the new LRSW's rating of 75-ton rating. When it is known that the LMs have carried as much as 100 tons, it is difficult to say how much the bigger trucks will carry. By the way, the LM's are also powered with Cummins diesels. An example of the type of loads encountered, these Macks have picked up and hauled away complete oil well drilling rigs, derrick and all. The whole outfit is put on skids. The truck backs in, hauls one end of the skid off the ground by winch power, makes fast, and then takes off across open country to the new drilling location leaving a trail of smoke where the skids have set the prairie on fire. Generally two men with brooms are assigned to put out the incipient grass fires as the haul progresses. In cases of an extremely difficult job, diesel crawlers are hooked up to the tow to lend a hand.

An outstanding feature of the LRSW is its heavy-duty Mack Balanced Bogie. The Balanced Bogie eliminates wheel fight, tire scuffing and consequent power loss. Two sets of springs, each rotating around its own trunnion point, support the boxie axles through huge rubber Shock Insulators. The wheels conform freely to whatever irregularities the terrain presents without imposing the slightest twisting stress upon the frame. When the vehicle is traversing rough ground which causese the axles to slant in oposite directions the frame automatically takes a position midway between. The rubber Shock Insulator spring-end mounts protect the frame from road shocks, eliminate wear and spring-end friction and require no lubrication. Three Mack Power Divider differentials, one interaxle and two axle types, divide the torque between the two bogie axles and, in turn, the four driving wheels. True differential action is maintained under all normal conditions. When operating under unequal tractive requirements the torque is distributed to favor the wheels having the most traction without power dissipation in useless slippage. Thus the LRSW can keep going over rougher ground and through deeper mud than many other trucks.

Axle shafts are full-floating type, housed in steel castings to provide great strength without excessive weight. The required total reduction is achieved through dual reduction at the carrier and planitary final reduction in the wheels. Large capacity Firestone tires insure a relatively low weight-loading per square inch. Despite tremendous weight when loaded the trucks has excellent floatation qualities.

As an aid to the drived, the LRSW is equipped with hydraulic power steering which actually permits the driver to steer the big truck as easily as a new pleasure car. To provide still further driving ease the individual driver's seat and controls are offset to the left assuring maximum vision both forward and to the rear. All controls are scientifically arranged for greater efficiency of operation.

The Cummins diesel engine is equipped with dual intake and exhaust valves. The bore is 5⅛, the storke is 6 inches, for a displacement of 843 cubic inches for all six cylinders. It is equipped with a continuous tube and fin radiator with an integral expansion tank.

275 hp. Cummins diesel drives this mammoth oil field truck.

REGULATION OF LUBE OIL PRESSURE

OFTEN overlooked in discussions of lubrication problems is the regulation of lubricating oil pressure in diesel engines. The maintenance of a constant even pressure in an engine lubrication system is essential for proper lubrication. Lubricating oil pumps must be of sufficient capacity to supply oil to the engine at the required pressure for operation at widely varying speeds and loads. It is for this reason that some manufacturers recommend independently operated lube oil pumps rather than the engine operated types.

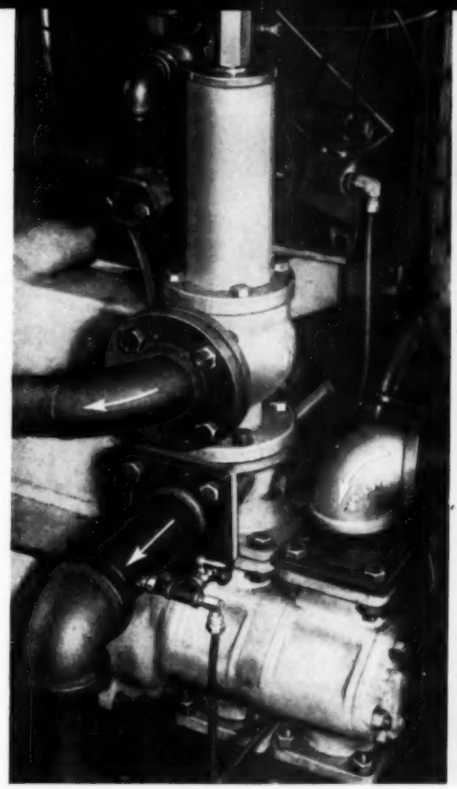
However, the use of pressure regulating valves can, to a great extent, maintain proper pressures in oil systems equipped with engine driven pumps. Along this line, the Klipfel Manufacturing Company has developed a new type of valve which has proven very successful in controlling fluid pressures to within 4 per cent of set values. It differs radically from the conventional back pressure valve in several respects.

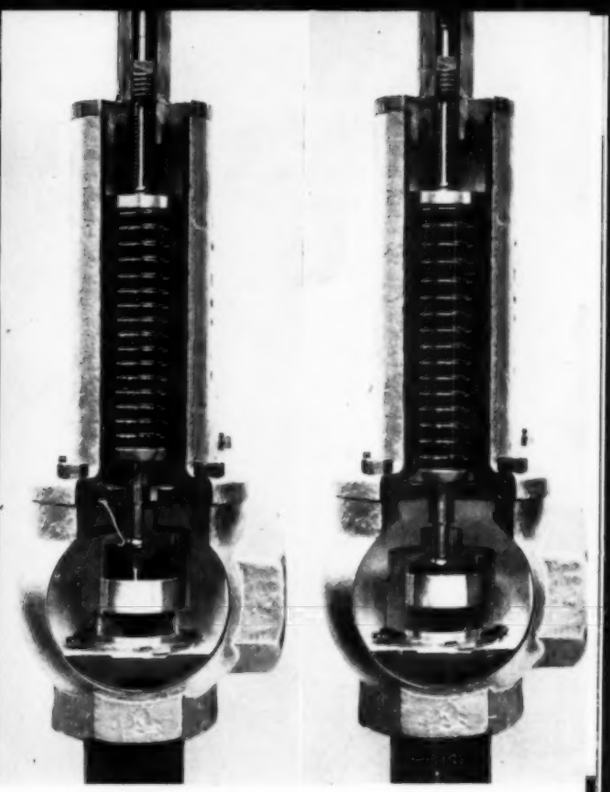
Instead of the flat disc valve, the new design incorporates a cup shaped valve disc. In the conventional design, the inlet pressure is uniformly effective over the disc area only when the valve is closed. As the disc rises, less of its area is fully effective since the pressure decreases toward the outer edge as the fluid escapes to the outlet of the valve. Consequently for a greater opening a higher inlet pressure is required to compensate for the loss of effective disc area. In the Klipfel design, the fluid pressure is transmitted to the space within the cup where it is confined and made uniformly effective over the entire inner head of the cup disc, regardless of the amount of valve opening. Furthermore, as the valve opens, the spring (see illustration) is compressed and, as the fluid rushes through the valve, its impact on the disc cup opening increases the pressure within the cup thus compensating for the additional spring pressure. This feature of the Klipfel valve eliminates pressure surges very effectively. Another feature is that the top of the cup disc, which is the moving part corresponding to the conventional flat disc, is open to atmospheric pressure whereas with the conventional type the pressure above the disc is variable and subject to fluctuation. Another improvement in this design is the valve seating arrangement which eliminates the "chatter" of some valve types.

When used in diesel engine lubricating systems where the outlet pressure is relatively constant—as when the valve discharges directly to atmosphere (vented crankcase)—the outer sleeve eliminated since the pressure encountered over the valve will have no adverse effect on the valve operation. Another interesting feature is that the Pitot tube connection, through which the oil pressure enters the valve cup to lift it, can be extended outside the valve body and connected into some more remote part of the system. In this way the valve is controlled by the pressure at some remote point rather than at the valve inlet. Thus it is possible to hold lubricating oil pressure constant near the bearings regardless of variations in pressure drop through the oil cooler and filter.

A recent government test has shown that close regulation is maintained by a two-inch Klipfel valve at rates of flow equivalent to about 4 times the capacity of 2-inch pipe. This particular test was made with steam at 15 and 35 psi. In general, it can be stated that, depending on the pressure drop available between valve inlet and outlet, this 2-inch Klipfel valve has a capacity equal to that of a pipe twice its nominal size.

The illustrations on this page illustrate the operation of the valve. The installation view above shows a Klipfel valve on a large diesel engine. On this particular installation the regulating valve is set at 70 psi. Excess oil is relieved through the valve to the engine crankcase. This assures a constant pressure of lubricating oil whether hot or cold, at high or low engine speeds.





(Above left) new type valve installed on large diesel engine, regulation of oil pressure is automatic at 70 psi. Klipfel valve is mounted on a "T" fitting which is bolted to gear pump outlet. Excess oil returns to engine crankcase (pipe upper left). (Above, center) Cutaway view of valve open (above right) valve closed.

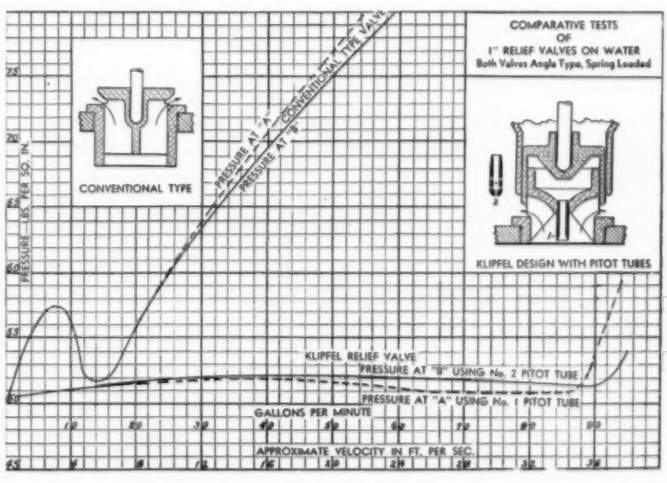


Chart compares Klipfel valve operation to conventional type. Note difference in two curves for flow and pressure for two different types, also the greater capacity of the Klipfel design valve.

TUNA CLIPPER "CORONADO"

By CHARLES F. A. MANN

THE endless argument among Pacific Coast tuna fishermen about which is best, the "Giant" or the "Baby" Clippers that carry enough bait, fuel and refrigerated cargo capacity to go roaming from California and the Oregon-Washington Coast to almost the North tip of South America after the world's most valuable food fish—seems to go on unabated.

During the current season the "Giant" and the "Baby" clippers seem to get better and more beautifully equipped, and the bait boat operators seem to be split into two camps—those favoring the bigger vessels on up to and beyond the 160 ft. mark, and those content with improving vessels that keep close to 100 ft. in length and have their power plants refined in size and quality and their layouts more scientific with each season's output of vessels. It is a sign of the times.

Typical of the newest and perhaps finest Baby Clipper is *Coronado,* built by Peterson Boat Building Co. of Tacoma for a syndicate made up of Joe Dores Jr., Captain; O. E. Hitchcock, Engineer; Cecil Drake of San Diego, the Managing Partner; Joe Dores Sr. and Arthur De Fever, noted California Clipper architect and designer.

The *Coronado* was finished in July and left for the South. It is 103 x 25 ft. 4¼ in. x 12 ft. depth and carries 185 tons of fish in 10 holds and 3 bait boxes. Total fuel capacity for the outbound voyage, augmented by carrying fuel in two pairs o lined fish holds is given at 36,000 gallons and maximum speed of just under 10 knots.

Crews space for 12, and rooms for the captain and engineer; a radio shack, and net rooms ar on the raised deck. The pilot house and char room is atop the raised deck, while the galley refrigeration machinery compartment, deck toilets and stores for the galley are located on the main deck. Headroom here is scarcely 6 feet to keep the ship's overall height low down.

The hull is heavy douglas fir construction, with plywood deckhouse with mahogany trim. Floors inside are either Magnesite or linoleum. A 16 ft

power launch with 90 hp. Chrysler engine is carried on top, and an Allan automatic pilot is carried in the wheelhouse. A Fathometer and a 350 watt Hallicrafter radio set is carried, together with the usual pilot house engine controls.

Mechanically, as neat a job of squeezing into a small vessel a huge assortment of diesels, pumps, refrigeration motors etc. as has been observed in small Clippers has been done on the *Coronado*.

Main propulsion is a 6 cyl. 12 x 15 Superior diesel developing 465 hp. at 450 rpm. This drives a Doran 57 x 41 in., 3 bladed propeller through a corrosion-proof monel metal tailshaft. Enterprise pilot house controls and a Weston tachometer set with gauges in the engine room as well as pilot house is fitted.

Auxiliary power is furnished by three 1200 rpm. Buda diesels developing 100 hp. each, and each driving 60 kw. 125 volt D.C. generators. Gardner Denver air starting motors are used on the auxiliary diesels. One auxiliary diesel always runs. Starting air is provided by two 30-in x 8 ft. steel air tanks, supplied by a Quincy compressor. Macdonald sanitary systems are fitted.

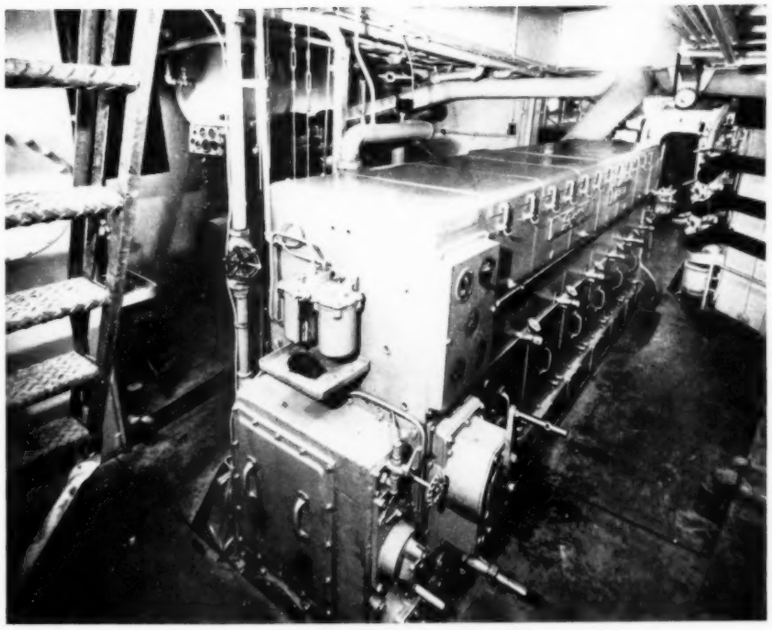
Fairbanks Morse 10 in. 15 hp. bait pumps are fitted; a 7½ hp. Bardco motor-driven Weinman fire pump and 12, 2-hp. Weinman brine pumps each driven by Bardco motors are fitted. Weinman brine transfer and bilge pumps and a 10 hp. Johnson winch, is fitted.

Four compact 4 cyl. Baker Quads each with cylinders 3½ x 3½ in. and driven by 15 hp. Bardco motors, and feeding a Baker condenser supply the main refrigeration requirements. Campbell Machine Company's 10 hp. hoist, a CO_2 fire extinguishing system and Maxim silencers on the main engine complete the equipment list.

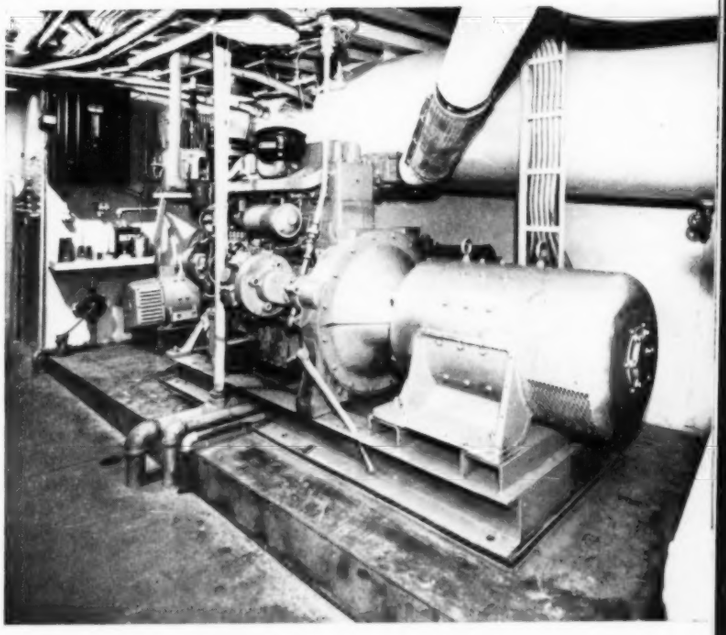
Coronado will hold its own among the Baby Clipper enthusiasts depending on quick turnarounds and economical operating cost to compete with the giant offshore Clippers that must remain at sea for weeks.

Time will tell which type of operation will show the best results in the long run. Both have distinct advantages and both have their shortcomings. At the present time however with tuna in competition with dollar a pound beef both types of fishing vessels do not have to worry about operational expenses too much. When the day comes when prices will be lower, that will be the time when boat size will play an important role in the competitive picture.

It is no longer a question of whether to select diesel engines for a tuna boat, only how big an engine to select. The *Coronado* is more or less typical of the type of small tuna clipper being built today with a power plant designed for moderate vessel speed and long cruising radius.



Above: *Coronado*'s main engine is 6-cylinder, 465 hp, 450 rpm. Superior diesel. It drives a three-bladed propeller through monel tailshaft.



Right, one of three Buda auxiliary diesels aboard driving Bardco generator for 60 kw output. Quincy compressor is seen in background.

Below, Battery of Baker ice machines aboard *Coronado* for chilling brine.

100 H. P. BRITISH MINE LOCOMOTIVE

Editor's Note: The development of the high powered flame proof diesel locomotive for use in mines including those of a gassy type has been the subject of much comment in the British technical press over the last few months. We present here a description of one of the latest types to be built in Britain.

THE locomotive is one of a number at present being built by the North British Locomotive Company both for the National Coal Board and for use abroad, and meets all the safety requirements of the British Mining Industry.

The unit presents a clean, streamlined appearance, having a flush finish with no projecting parts. This has been achieved without resorting to false cover plates and mouldings, whilst immediate access to all internal parts of the locomotive can be effected by the opening of the appropriate doors. These doors which cover the full length of the locomotive, are removable.

The principal dimensions of the locomotive are as follows:

Maximum Length over Buffer Beams ..	15'1"
Maximum Width over Platforms	4'0"
Maximum Height	4'5"
Wheel Arrangement	0-4-0
Wheelbase	4'7"
Dia. of Wheels	2'0"
Weight in Working Order	15 tons
Minimum Curve	60 feet
Maximum Speed	15 m.p.h.
Maximum Tractive Effort at 25% adhesion	8400 lbs.
Gauge	2'6" to 3'0 "

External dimensions remain the same for both gauges and for gauges over 3' 0" the width only is increased proportionately.

Calculated on the basis of 25% adhesion, with a running resistance of 20 lbs./ton and an efficiency of 80%, the following performance is obtained inclusive of the weight of the locomotive.

Grade	At 3.0 mph TE = 8400 lbs.	At 6.5 mph TE = 4380 lbs.	At 1.5 mph TE = 1900 lbs.
Level	420 tons	219 tons	95 tons
1 in 100	198 "	103 "	45 "
1 in 50	130 "	68 "	29 "
Assuming a running resistance of 14 lbs. the following loads apply:—			
Level	420 tons	312 tons	136 tons
1 in 100	198 "	120 "	52 "
1 in 50	130 "	75 "	32 "

The locomotive ilustrated carries a Paxman 6 RQE vertical type C.I. engine which drives through a rubber bonded flexible coupling to an SLM oil operated 3-speed gearbox, but the design is such that a Crossley BWL5 engine may be substituted in place of the Paxman and a Wilson, SSS or Voith type transmission replace gearbox.

The Paxman engine has cylinders 5" bore x 5⅞" stroke, and has an output of 100 hp. at 1250 rpm. on the B.S.S. 12 hr. rating. The engine operates on the four-stroke principle with a water-cooled exhaust manifold and is arranged for air starting at 400 lbs/sq. in. by direct admission.

The controls are simple and few, and from the driving position an unobstructed view is obtained in both directions, there being no side cab windows which so often necessitate blind traveling on curves as is true of other types.

The locomotive is fitted with Westinghouse air brakes acting on all wheels and has air operated sanding gear, which is arranged so that if an emergency brake application is made, the wheels are automatically sanded at the same instant.

The S.L.M. change speed gearbox is of the oil-operated type coupled to the engine crankshaft through the medium of a flexible coupling and transmits the torque of the engine through gear wheels to the final drive and reverse unit. The final drive is through bevel pinions to forward and reverse crown wheels and to a spur reduction gear on the jackshaft which, in turn, drives through cranks and side rods to the road wheels linked together by coupling rods.

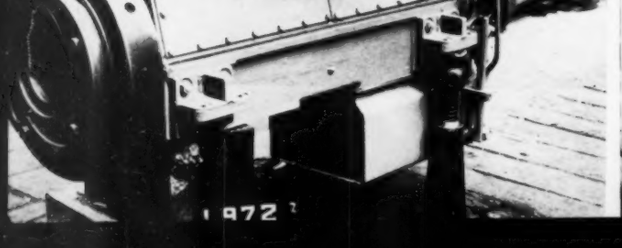
The gears are constantly in mesh and have an internal oil operated clutch in each which ensures a perfectly smooth take up load without jerk or noise and resultant damage.

A feature of the gearbox is the emergency cut-out device which effects the automatic disengagement of the clutches in the event of the engine tending to stall and prevents any reverse torque or over drive being transmitted.

The exhaust conditioner which is housed in the front of the locomotive, is arranged to wash and cool the exhaust gases from the engine by passing them through water and over a number of baffles to a chamber containing a large number of Lessing rings. These Lessing Rings act as a scrubbing medium for the gas and a tray for moisture. with the result that the gas finally passing through the stainless steel blade type flame trap, is both clean and dry. The flame trap is constructed so as to be readily removable for cleaning purposes and is interchangeable with the flame trap on the engine air intake. Exhaust gases leaving the flame trap are caught in the air stream from the radiator, the diffusion ratio of gas to air being 1/16 in volume thus ensuring a rapid dissipation of the exhaust.

The air reservoir, fuel and water tanks are built as a complete assembly arranged in such a manner that only a very few pipe conections need be broken to enable this assembly to be lifted out of the locomotive to give complete access to the gearbox.

Six cylinder Paxman diesel, 100 hp at 1250 rpm, four cycle, bore 5-in., stroke 5⅞ which drives locomotive.



View of 100 hp. flameproof mine locomotive recently built by the North British Locomotive Co. Ltd. It is slightly over 15 ft. in length.

Giant Mobile Crane

Two Waukesha diesels drive this Thew Moto-Crane which dwarfs modern car beside it.

A SPECTACULAR advance in mobile equipment for handling heavy materials, which makes possible the lifting and transporting of loads heretofore beyond the capacity of such equipment, is signalized by announcement from Thew Shovel Co., of a giant, rubber-tired, two-engined diesel crane. The new unit is the culmination of the manufacturer's 30 years of motorized crane experience, beginning with origination of the truck crane during World War I. In sharp contrast to the MC-820's 45-ton capacity, the truck crane of 30 years ago had a capacity of only 3½ tons.

Weighing 65 tons, the new monster moto-crane has the following overall dimensions: length, with boom in travel position over front of carrier, 66 ft., 5 in.; width, outside to outside of tires, 11 ft., 7¾ in.; height with gantry erected 19 ft., 5 in., with gantry lowered 14 ft.

The Moto-Crane comprises two basic components. These consist of the carrier or rubber-tired mounting, which transports the unit from place to place; and the turntable, or revolving superstructure, which is attached to the carrier frame. While the carrier is automotive in general design, it has been engineered specially to serve as a mounting for heavy-duty crane lifting service and therefore, departs from the ordinary motor truck design.

The MC-820 Moto-Crane is equipped with two Waukesha diesel engines. One engine, rated at 225 hp., furnishes power for propulsion of the carrier up to speeds 18 mph. This engine is equipped with a 24-volt electric starter, generator, air cleaner, muffler, oil filter, and air compressor of 12 cu. ft. capacity. The other engine powers the turntable mounted on the carrier.

The Fuller transmission, mounted behind the engine, provides a range of 5 forward speeds and one reverse speed. Forward speeds range from 1¾ mph. to 18 mph. Corresponding gradeabilities for the unit, based on use on dry concrete road surface, range from 2.3% to 37%. A 29% grade may be climbed in reverse. Mounted behind the 5-speed transmission is a Timken-Detroit power divider from which equally divided power is transmitted by separate propeller shafts to each of the two driving rear axles.

Rear axles are double reduction gear driven axles. Rear axles are mounted on equalizer beams instead of rear springs. A parallel torque rod system is used to hook up the rear axles. This hook-up takes the driving and brake torque; eliminates transfer of weight from one axle to another and prevents one axle from "digging-in" or "fighting" the other axle. These axles are among the largest ever built commercially by Timken Beloit Axle Co. for crane use.

The front axle is a dead, non-driving, axle of the heavy tubular type. It is mounted on heavy-duty type springs equipped with helper springs. The front axle is equipped with dual wheels, each wheel being mounted on separate bearings to give a differential action to prevent tire scrubbing and to facilitate easier steering. Front wheel steering is accomplished by a combination of Ross cam and gear heavy-duty cam with twin lever manual steering aided by Bendix Westinghouse air assist steering applied to each wheel.

All wheels are dual wheels and all are equipped with 13:00 x 24 eighteen-ply Rock Grip excavator tires designed for off-the-road service. All tires are equipped with heavy-duty tubes. All rear wheels are equipped with Bendix-Westinghoues service air brakes of the internal two-shoe type actuated by constant lift cams.

The turntable, or superstructure, is mounted on the carrier with the center of rotation just ahead of the front rear axle. At full-load speed, the turntable Waukesha diesel is rated at 164 hp.

Power from the engine is transmitted through a Twin Disc hydraulic coupling. The coupling delivers a smooth flow of power to the operating mechanism. The coupling prevents the engine from stalling because of any lifting or digging circumstances. It also acts as a "shock-absorber," or cushion, between the impacts and shocks of operation and the mechanism of the turntable.

Power is transmitted from the diesel to the mechanism by means of a multiple-strand Diamond roller chain to a center drive pinion. This pinion, in turn, meshes with the three power shafts of the turntable, hoist, swing and boom derricking or shovel-crowd shaft. By means of this type of power transmission, all the engine power may be applied to any one operation or may be spread in proper balance to 2 or 3 simultaneous operations. Actual engagement of the various turntable operations is through internal expanding band clutches controlled through Booster Bands.

Units of the MC-820 Motor-Crane have been produced and sold commercially. Typical of the spread of applications are its uses by the Jones and Laughlin Steel Corp. in the $12,000,000 coke oven installation at its Aliquippa Works, and in log loading service in the Pacific northwest.

GIRDING FOR THE COMPETITIVE FIGHT

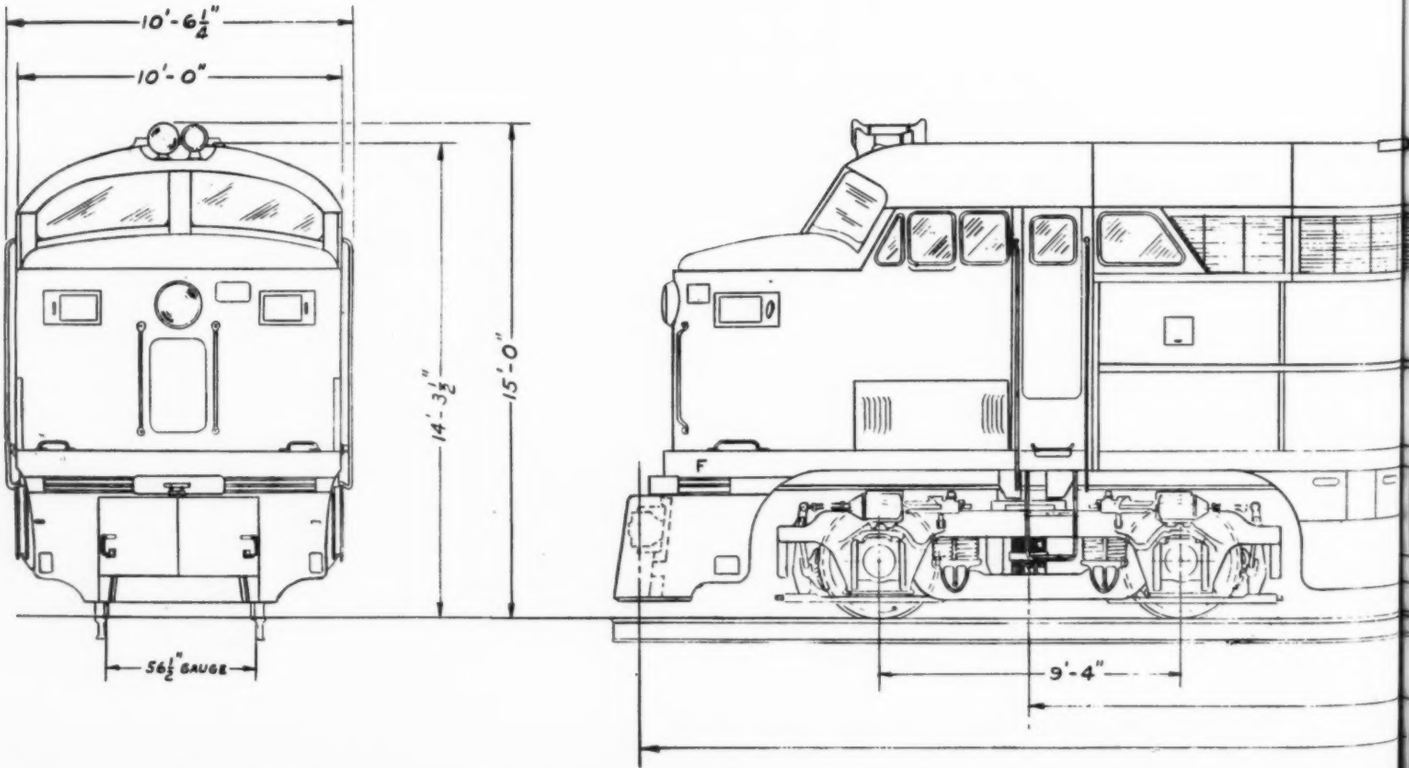
Fairbanks-Morse Announces Its New "C" Line of Locomotives . . . An Example of Progressive, Anticipatory Planning.

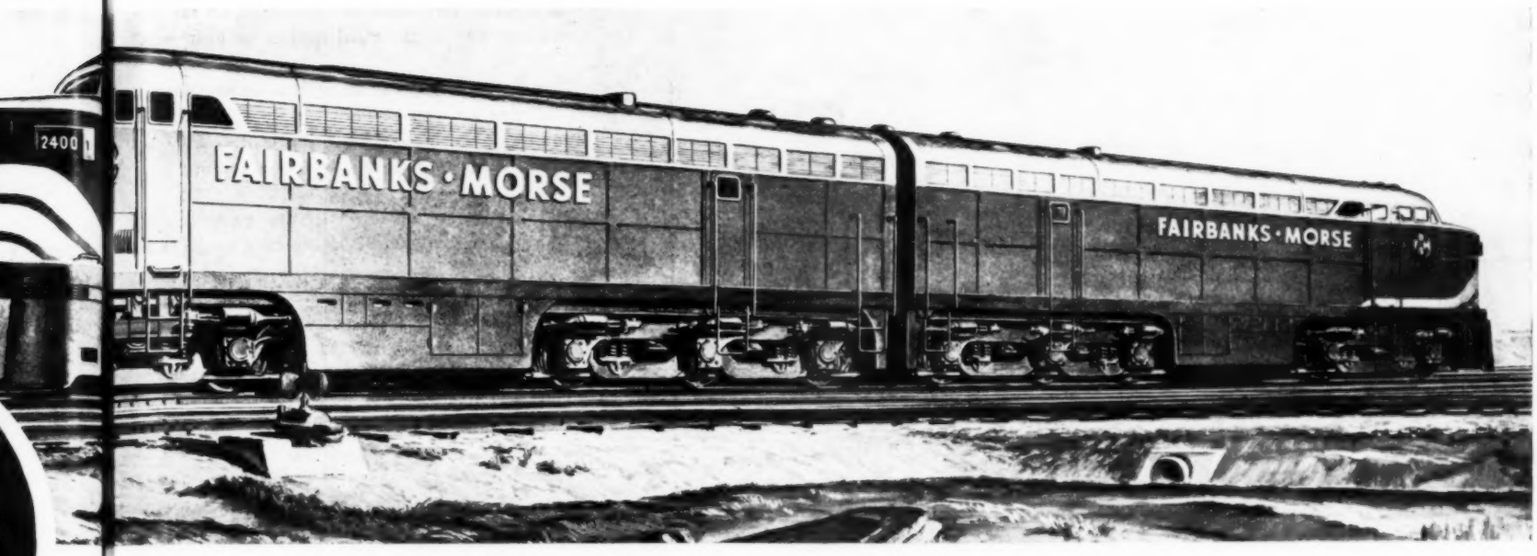
By REX W. WADMAN

V. H. Peterson, manager of the Fairbanks, Morse and Co. Locomotive Division.

(Left) Robert H. Morse, Jr. Vice President of the company offered a complete new line of locomotives to the railroad industry.

(Below) Left to right; Front, Side and Rear Elevation of new "Consolidation Line" of diesel-electric locomotive built by Fairbanks, Morse and Co.



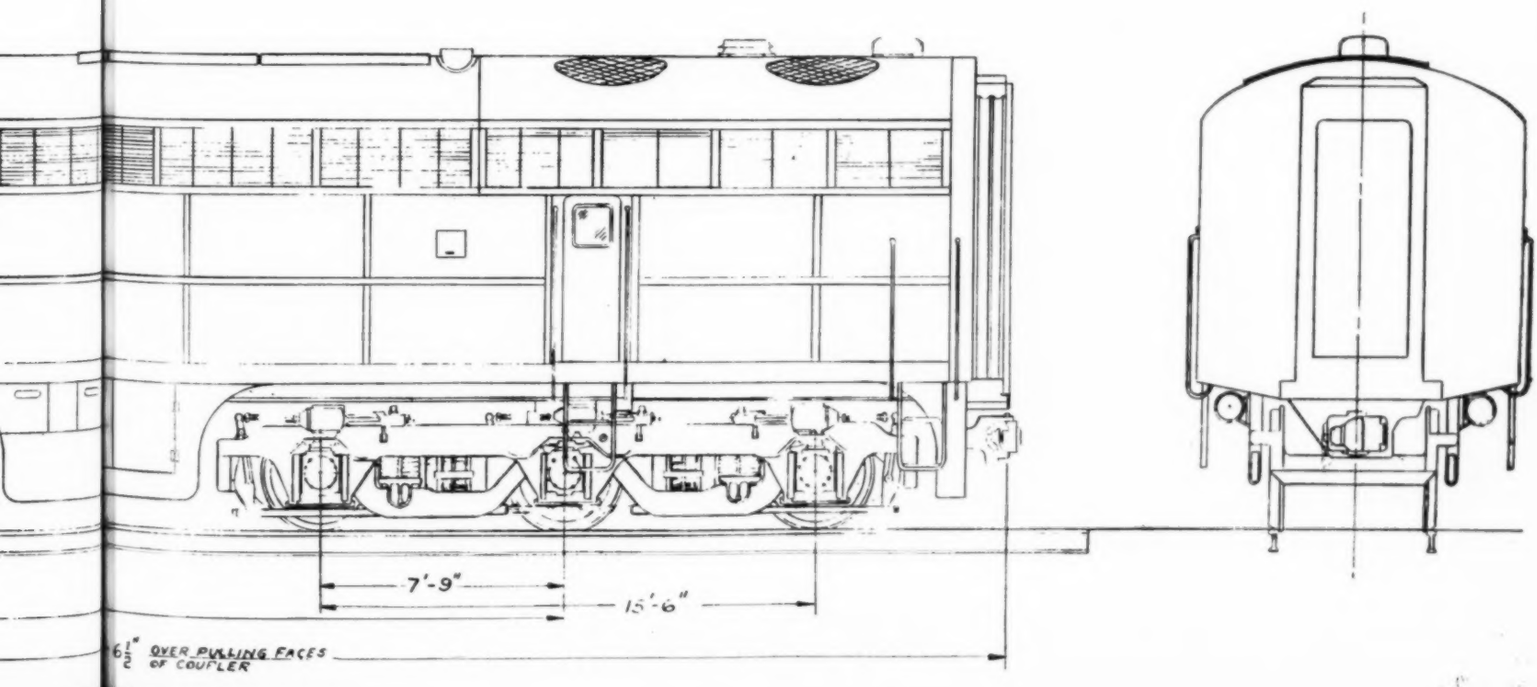


New F-M 4800 hp. "Consolidation" locomotive consisting of two 2400 hp. units.

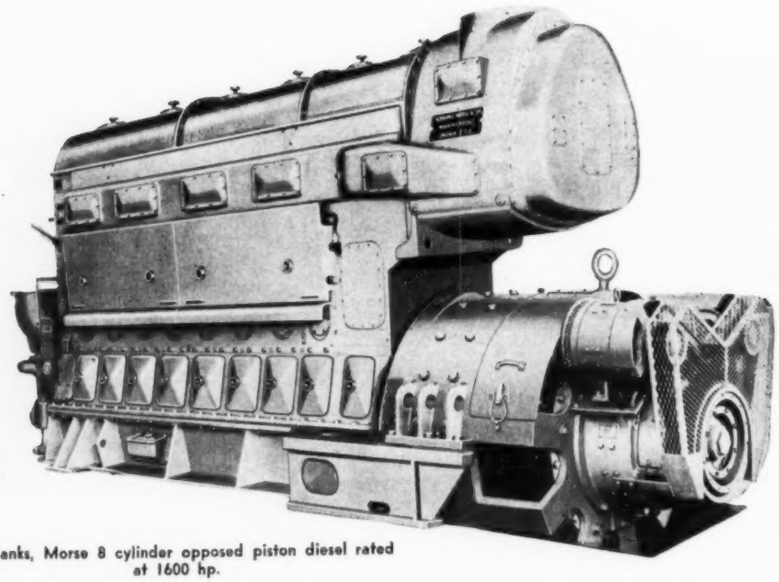
CHICAGO, Saturday, September 25: Here on the shores of Lake Michigan today, and fittingly, in the busiest railroad center in the world, a big bet was placed in the diesel locomotive game. Blue chips—lots of them, went down with obvious courage of conviction backing every chip. Fairbanks-Morse holds the hand and in it is its completely new line of diesel Road Locomotives which will be known as the "Consolidation," or "C" line. This is a fast-moving game. A year now is equal to five or ten in the old (almost forgotten) steam days, so with a brief backward look we will get on with what we saw and heard here today.

Only four years ago, Fairbanks-Morse delivered its first diesel locomotive to the Milwaukee Road—a 1000 hp. switch engine. Since then some twenty railroads have purchased F-M switchers and road locomotives—enough to establish the feasibility of the well-known F-M opposed piston diesel in locomotive application. And time enough for F-M to learn what railroads want in motive power. Thus a pattern took shape, and for the last two years or so, F-M has been quietly developing the design of a basic road locomotive that can be readily adapted to a wide range of motive power requirements—actually equal to 180 locomotives, each having different operating characteristics. Here is how it is done.

Heart of the new F-M "C" line of locomotives is the opposed-piston diesel, any one of three sizes of which can be applied to one basic chassis. The engines of same bore and stroke, differ only in number of cylinders, the eight-cylinder engine being rated at 1600 hp., the 10 at 2000 hp., and the



ELECTRIC LOCOMOTIVE EXTERIOR



Fairbanks, Morse 8 cylinder opposed piston diesel rated at 1600 hp.

12 at 2400 hp. With this range of prime movers it was shown that locomotive units can be combined to make up twenty different locomotives with ratings from 1600 to 9600 hp. in increments of 400 hp. Also that each of the twenty possible combinations of units can be equipped with any one of nine different gear ratios which gives a possible total of 180 different locomotives available from one basic cab and chassis. That is the new F-M "Consolidation" line—"C" line for short.

The railroads have learned a lot in a few short years too. They have learned that they can haul heavier trains faster and farther with diesel locomotives—they have in fact learned that the ceiling on speed and weight of trains has not yet been reached. And now with 9600 hp. available in four units, geared for freight service, who knows where they will go. That is a lot of power—a lot of locomotive, Mr. Reader—and it reflects the Progressive, Anticipatory thinking that Fairbanks-Morse has given to the art of locomotive design.

This kind of thinking has also been projected into the problems of maintenance and repair. For example, the basic "C" line locomotive is built up around standardized, interchangeable subassemblies including first and foremost, the opposed-piston diesel itself, the air compressor, water tank, dynamic braking, electrical units, all of which are pre-assembled and then installed in or on the cab and chassis and connected with prefabricated wiring or piping as the case may be. The freight locomotive may be easily converted for passenger service by installing a standard, preassembled boiler and changing the gear ratio.

In order to get maximum loading on the driving wheels and at the same time to keep total weight down to a minimum, six wheel trucks are used only where needed, that is on the rear end of the unit, while four-wheel trucks are used on the forward end. F-M estimates that as a result of such planning, the "C" line 6000 hp. passenger locomotive can pull 92 tons more than the present 6000 hp. F-M passenger locomotive.

How much of the "C" line locomotive will be built by Fairbanks-Morse? Let V. H. Peterson, manager of the F-M, Locomotive Division, answer that in his own words. " . . . In the matter of electrical equipment, the Westinghouse Electric Corporation has cooperated with us and will furnish the traction motors, generators and controls. Manufacture of all other equipment will be carried out—is already started—in our shops in Beloit, Wisconsin. First units will be coming off the production line in the third quarter of next year."

Mr. Peterson goes on to say that among the first "C" line units to be built will be a special demonstrator locomotive consisting of two 2400 hp. units which will travel about the country.

Well, the bets are down in this exciting game, the stakes are big and F-M is betting on its "Consolidation" Line. R. H. Morse Jr., F-M's alert Vice President, with his characteristic quiet determination, threw down the gauntlet when he said in part: ". . . from the first we were aware that we had a rare opportunity to design a new line of locomotives around the opposed-piston engine—a line that, in departing from the conventional and forsaking tradition, would offer completely new and higher standards of performance, operating cost, adaptability and ease of maintenance." In explaining their choice of "Consolidation" as the name of the new F-M line of locomotives, Mr. Morse said, " . . . we believe we have consolidated in one line more operating advantages and features than have been offered to the railroads. . . ."

This kind of engineering initiative and commercial courage spells progress—it made America great and it will keep it great. It is the stuff that started our great railroads on a dieselization program that has gathered such momentum as only the swiftest may pace and who knows where it will stop.

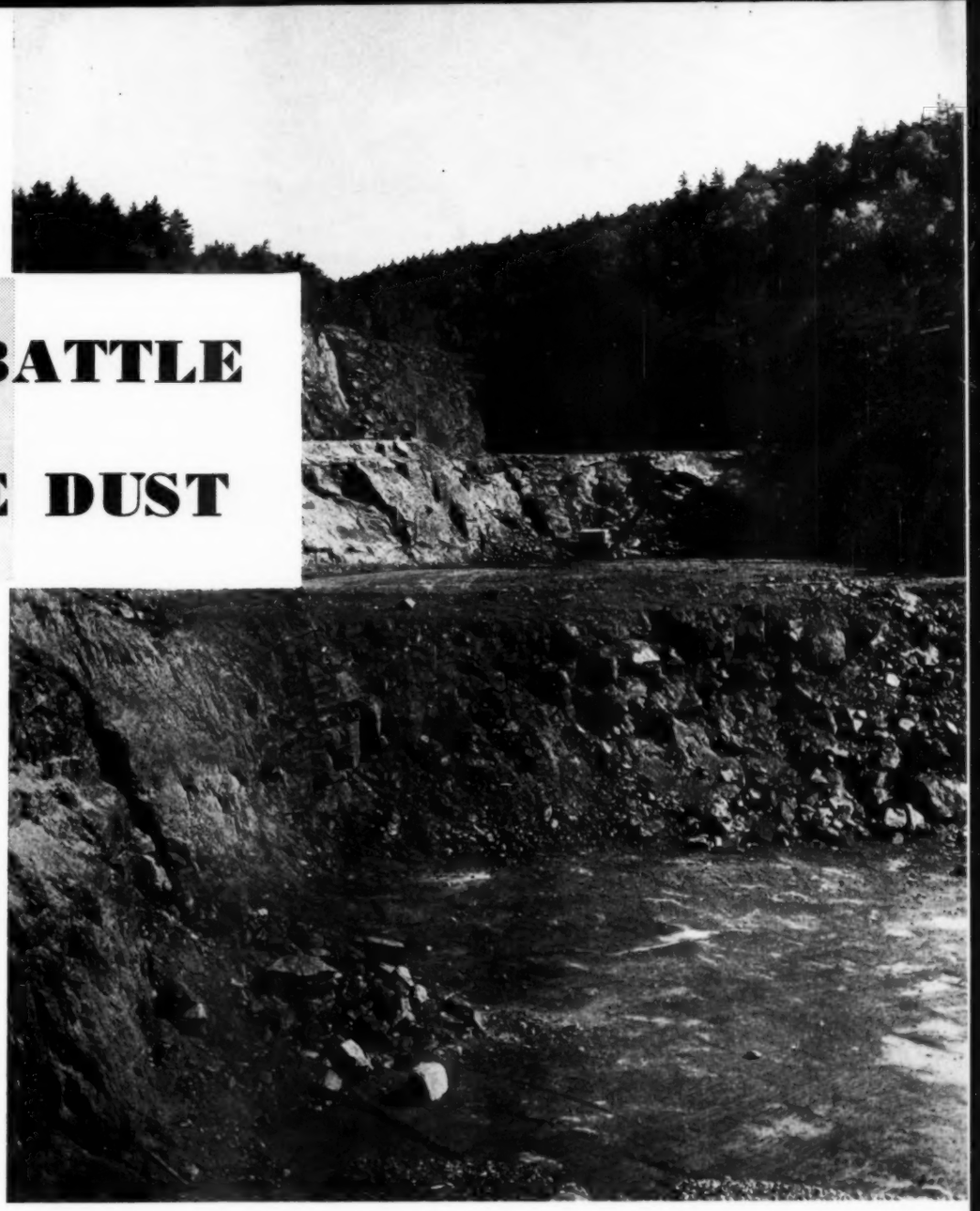
Statistics on "Consolidation Line" of F-M diesel locomotives.

FAIRBANKS-MORSE CONSOLIDATION-LINE ROAD LOCOMOTIVE UNITS

Horsepower (One Engine Per Unit)	1600	2000	2000	2400	2400
Service	Comb.	Freight	Pass.	Pass.	Freight
Wheel Arrangement	B-B	B-B	B-AIA	B-AIA	B-B
Steam Generator (3000 lb/hr)	Yes	No	Yes	Yes	No
Dynamic Braking Available	Yes	Yes	Yes	Yes	Yes
Major Dimensions					
Length Inside Knuckles, Ft.-In.	56-7	56-7	56-7	56-7	56-7
Height Over Roof, Ft.-In.	14-3½	14-3½	14-3½	14-3½	14-3½
Overall Height, Ft.-In.	15-0	15.0	15-0	15-0	15-0
Width Over Cab Sheets, Ft.-In.	10-0	10-0	10-0	10-0	10-0
Overall Width, Ft.-In.	10-6¼	10-6¼	10-6¼	10-6¼	10-6¼
Front Truck Wheelbase, Ft.-In.	9-4	9-4	9-4	9-4	9-4
Rear Truck Wheelbase, Ft.-In.	9-4	9-4	15-6	15-6	9-4
Total Wheelbase, Ft.-In.	43-5	43-5	43-5	43-5	43-5
Minimum Radius Curvature					
Locomotive Alone, Ft.	275(21°)	275(21°)	275(21°)	275(21°)	275(21°)
Weights Fully Loaded					
Total Locomotive, Lbs.	240,000	•252,000	274,000	284,000	252,000
Per Driving Axle, Lbs.	60,000	• 63,000	56,000	58,000	63,000
Per Idle Axle, Lbs.	—	—	50,000	52,000	—
Transmission					
Driving Motors	Four	Four	Four	Four	Four
Driving Wheels	Four Pair	Four Pair	Four Pair	Four Pair	Four Pair
Diameter Wheels, In.	42	42	42	42	42
Starting Tractive Effort, 25% Ad.	60,000	63,000	56,000	57,000	63,000
Continuous Tractive Effort, Lbs.					
65 MPH Gearing	42,800	42,800	42,800	42,800	42,800
100 MPH Gearing	26,400	—	26,400	26,400	—
Two-Hour Tractive Effort, Lbs.					
65 MPH Gearing	53,200	53,200	53,200	53,200	53,200
100 MPH Gearing	33,000	—	33,000	33,000	—
Continuous Speeds, MPH					
65 MPH Gearing	11.7	14.7	14.7	17.6	17.6
100 MPH Gearing	19.0	—	23.8	28.5	—
Supplies					
Fuel, Gals., Nominal Supply	1200	1200	1200	1200	1200
Fuel, Gals., Maximum Supply	1600	1600	1600	1600	1600
Lubricating Oil, Gals.	300	300	300	300	300
Engine Cooling Water, Gals.	310	330	330	350	350
Sand, Cu. Ft.	20	20	20	20	20
Boiler Water Nominal, Gals.	1200	—	1200	1200	—
Boiler Water Maximum, Gals.	1800	—	1800	1800	—

• Weight can be reduced if required.

DIESELS BATTLE ABRASIVE DUST



By BRUCE C. SISSON

Barton Mines quarry near top of Gore Mountain. Garnet ore is handled by diesel shovel (background).

HIGH up on Gore Mountain in New York State's Adirondack Range, diesel engines are operating successfully under conditions which would make their design engineers cringe.

The Barton Mines Corporation of North Creek, N. Y. has been mining garnet bearing rock for sixty years all told. Garnet, besides being a semi-precious is extremely valuable as a cutting agent. It rates second only to the diamond in hardness. Therefore it has widespread application in cutting and polishing wheels and other products.

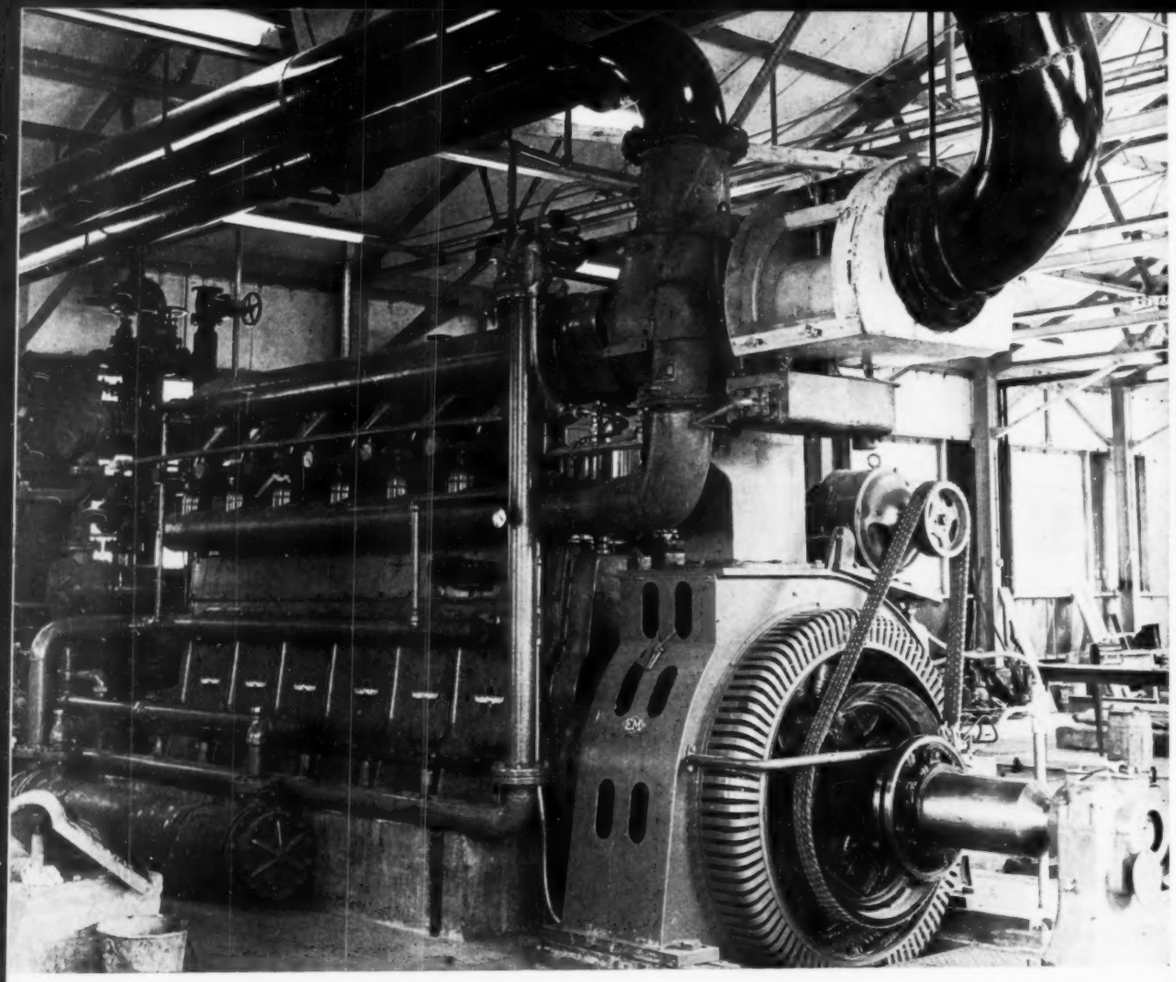
The operation began 60 years ago as a hand picking selection of garnet. The garnet rock was found in pockets in the glacial granite formation of the mountain sides, necessitating the liberal use of dynamite, and strong backs to pry it loose. However, in 1923 a change was made in the operation and a concentrating plant was installed. Open quarry mining was utilized and the garnet-bearing granite was hauled to the plant where it was crushed and separated by gravity and flotation methods. The resultant garnet thus separated was graded in size from 300 mesh to 5 microns, and then sold.

To power this plant, the management purchased two 130 bhp. Baldwin-De LaVergne diesel engines. These engines were installed in 1923 and are still operating at full load speed—277 rpm. and doing a good job month after month.

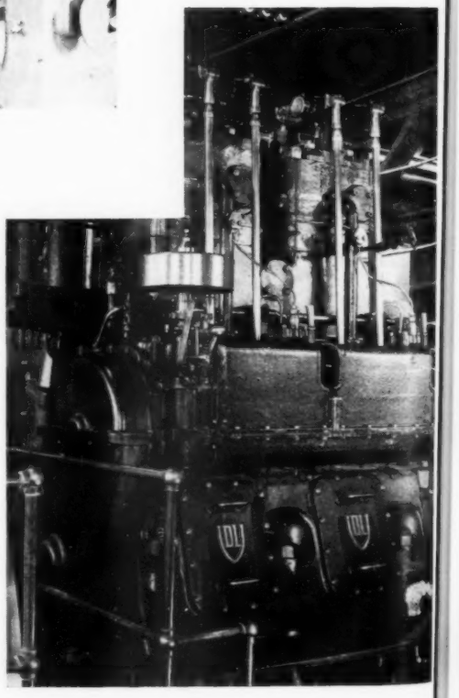
In 1935 a third De LaVergne engine was installed. This diesel is 240 bhp., 6 cyl., 600 rpm. and drives a 165 kw., 240 volt General Electric a.c. generator. In 1941 in response to the demands for increased production, a 6 cyl. Worthington diesel was added to the power roster. This engine was connected to a 125 kw. Electric Machinery a.c. generator turning at 600 rpm.—engine speed. More power in the form of a 285 hp., 6 cyl., 720 rpm. Chicago-Pneumatic diesel was installed in 1945. This engine drives a 200 kw., 240 volt G.E. generator.

These engines were located right in the crushing plant almost directly under the crushing machinery. It need not be explained that the diesels were in a continual dust bath, but not ordinary dust at all. It was almost as sharp as diamond dust which is universally regarded as the best cutting agent in existence. It wasn't too happy an arrangement but the diesels managed to survive. The dust created in the crushing process is so fine that a handful of it thrown on a glass window will adhere to the glass. It covers the engines with a gritty blanket.

A sample of what this dust can do to an engine is found in the maintenance log for one particular diesel in recent years. The cylinder liners adjacent to the air intake end of the engine had to be replaced twice a year while the No. 6 cylinder, the one farthest from the air intake, had a life of five years. Chief engineer, Erwin Andrus attributes this variation in wear to the fact that the relatively dense dust particles are sucked into



New 875 hp turbo charged Worthington diesel installed in new power plant turns a 580 kw. Electric Machinery Co. generator. Note Elliot-Buchi turbocharger.



One of the two 130 hp de LaVergne diesel which have powered grinding machinery at Barton mines for 25 years.

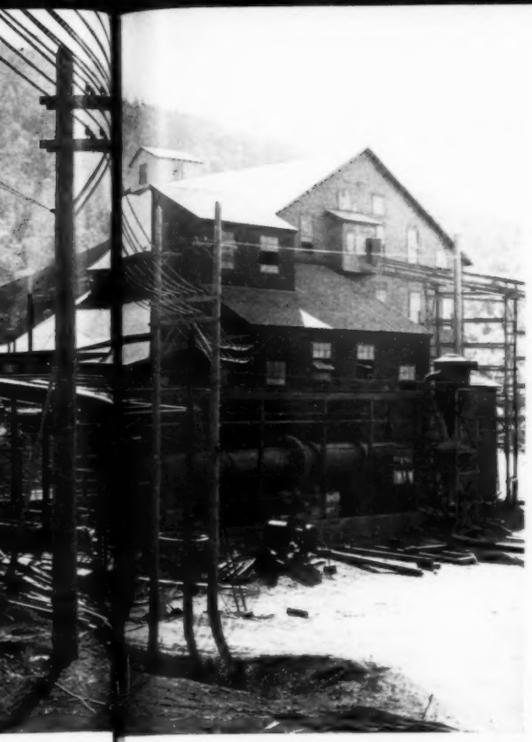
the nearest cylinder available to do their dirty work there. Various makes of air filters have been used on these engines with varying degrees of success since that time.

As regards the question of oil filtration, the Barton Mines diesels faced more problems. Up until 1946, the engines were operating with metal edge type filters which were excellent for removing particles .003" and over in diameter but passed the micronic particles of garnet and granite dust. So in 1946 the Fram Corporation made a study of the plant and engine set up and recommended that finer filtration be utilized. In May of that year Fram filters were installed on the 240 hp. Baldwin-De LaVergne, the Worthington and the Chicago-Pneumatic diesels. They were hooked up on a by-pass arrangement with 2 two cartridge units per engine. "Filcron" cartridges were used. The engines, previous to the installation of these filters, had had a tendency to form sludge to such an extent that it caused the plugging up of oil passages which resulted in the burning out of vital engine parts. The Chicago-Pneumatic diesel had been sludging up every four months requiring a complete cleaning of the oil passages in the engine. This was particularly true of the oil line to the gear train bushing.

The lube oil consumption of one of the diesel engines previous to the installation of the filters had gone as high as 8 gallons per eight-hour shift and this was only six months after engine overhaul. After the filter installation the engine was using less than 2 gallons per shift fourteen months after overhaul. The lube oil consumption of the Worthington diesel was cut by a full two-thirds following the filter installation. The De LaVergne diesel showed comparative improvement. Another big factor in favor of filtration was that time for engine overhaul was cut by one-third. The removal of engine sludge by the filters made this tedious cleaning job much easier for the mechanics and speeded up the entire operation. Filters are changed every two months.

Regardless of the improvements shown by filtration the deadly effect of garnet dust on the engines both in liner and piston ring wear required a change in location for the diesels to get them out of the erosive atmosphere of the grinding plant. In 1947 it was decided that a new power plant building should be built to house the three diesel generating sets along with a new Worthington diesel to be purchased. It was located approximately 200 yards from the crushing plant—far enough away to escape the dust. This new building was completed in early 1948. The new Worthington diesel, a 6 cyl., turbo-charged model is rated at 875 hp. at 600 rpm. It was installed in April 1948. The diesel drives an Electric Machinery Co. 240 volt a.c. generator, 3-phase, developing 580 kw. It is equipped with a General Electric Diactor voltage regulator.

The new diesel will not have to undergo the trial that faced the three previous engines. The new building is relatively dust-free. The air intake is protected by an Air Maze filter. Fuel oil is filtered by a 4-unit Cuno AutoKlean. Another full flow Cuno edge type filter handles the lube oil. Additional lube oil filtration is supplied by six Fram units operating on a shunt system. Water and lube oil coolers of the shell and tube type are of Ross Heater manufacture. Makeup jacket water



is distilled from surface water by a Stokes Water Still rated at one gallon per hour.

The Elliott-Buchi turbocharger installed on the Worthington diesel is rated for a maximum inlet temperature of 1020° F. and a maximum speed of 16,600. This is well above the operational rating for this particular installation.

Viking safety alarms are installed for lube and water systems. A Woodward governor is installed. Jas. P. Marsh gauges are installed for fuel oil, lube oil, and water pressures. An Alnor exhaust pyrometer gives readings for each cylinder. The fuel injection system is Bendix Scintilla. American Brass Company supplied the flexible metallic hose for intake and exhaust connections.

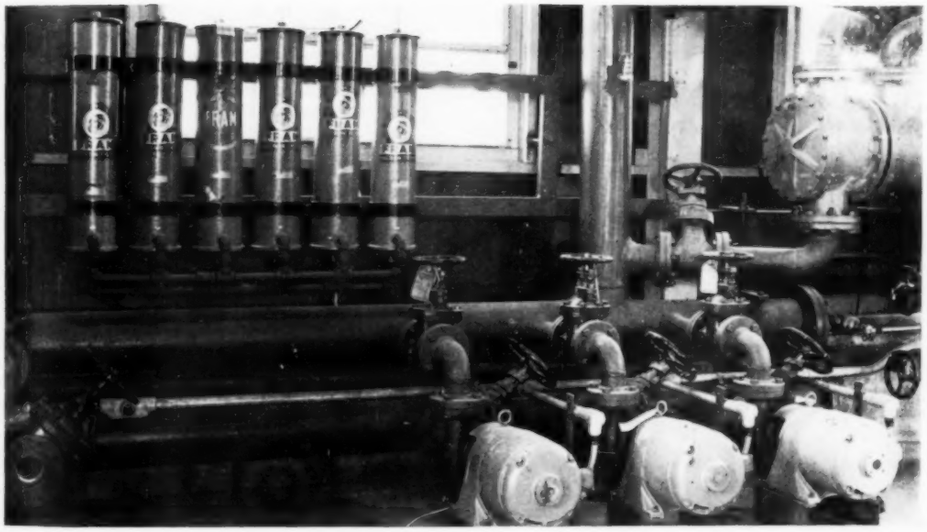
When the three diesels are moved into the new plant, they will be connected to a common cooling system. Eight Worthington pumps—four for jacket water and four for cooling water — have already been installed. This will make a compact and efficient installation.

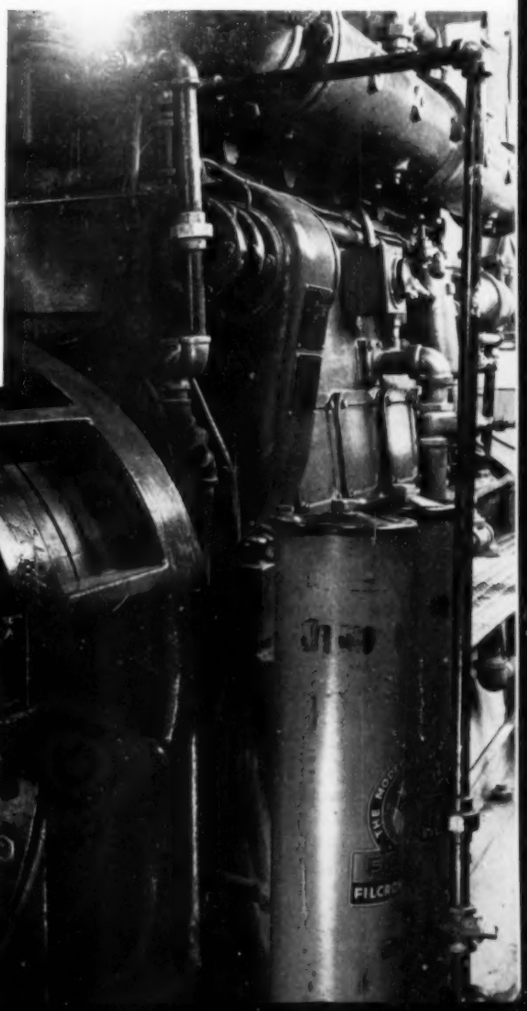
Not much has been said yet of the two De LaVergne diesels which were installed originally in 1923. These are two-cylinder engines. These units are not connected to generators but supply their steady power by means of a maze of shafting and belts to the crushing plant above. These diesels have operated steadily for 25 years with the original main bearings still in service. Evidently the clearances of the old timers have saved them from excessive wear.

Chief Engineer Andrus and his father before him battled abrasive dust for 25 years at the Barton Mines. The diesels under their care have turned in excellent performances considering the operating conditions faced, but it has been a struggle all the way. Now with a new plant building and modern accessories installed, trouble should be practically eliminated.

Garnet production is in full swing with 40 tons of meshed stone being turned out every day. It takes a lot of power for this production but the diesels can produce it handily. When the new diesel goes into service the output will total over 1050 kilowatts. Part of this power will be utilized by a new dryer being installed at the plant.

Left, Barton Mines crushing and separating plant on Gore Mountain which houses five diesel engines.





(Above) Filter installation for the new Worthington diesel. It operates on a shunt system. (Right) Fram filter installation on Chicago Pneumatic diesel. (Below) View of de LaVergne diesel showing Fram filter arrangement.

FUEL OIL FOR DIESEL LOCOMOTIVES**

The outlook for future petroleum supplies is a matter of great importance because our vital transportation industries are dependent to a large extent upon some form of oil for power. Even though year after year new discoveries of petroleum have more than equaled the ever-growing demand, recent temporary local shortages of petroleum, particularly heating oils, have caused an increasing amount of public concern.

Our nation has become so dependent upon the Diesel locomotive because of its superior performance and its high operating economy that attention has been focused on the increasing use of Diesel fuels by the railroads. To evaluate the railroad liquid fuel requirements and to appraise the outlook for their continued future supply, it is essential to consider the amount of fuel used by the railroads in relation to the quantities used by other important consumers.

From analysis of the facts as presented in the following pages, I am confident that American industry has the resources and the ability to meet the growing fuel demands of our transportation industries, including the railroads, for a great many year to come.—Charles F. Kettering, Director, General Motors Corporation.

The shortage of petroleum products, brought about by an unprecedented post-war demand, has naturally caused concern about the future supply of liquid fuels to serve the domestic needs of our country and to provide for the national defense in time of war. Difficulties in obtaining sufficient fuel oil for home heating in certain parts of the country aroused protests from many local, state, and federal officials and agencies. The publicity which was given to these protests singled out the Diesel locomotive as one of the principal offenders in causing the fuel shortage. In fact, certain elements have contended that the expanding use of Diesel power by the railroads has placed a heavy burden upon the refining capacity of the country and has further accelerated the drain upon our diminishing oil reserves. *These contentions are so misleading that it is imperative* for the guidance of national policy to bring out forcibly the true facts of the situation.

In 1947, the total consumption of petroleum products in all fields of use was about 5½ million barrels per day. Of this total, *the railroads-* according to Interstate Commerce Commission reports, absorbed some 317 thousand barrels per day or 6% as follows:*

Heavy fuel for oil-burning steam locomotives	265,000 bbls per day
Diesel fuel for all Diesel-Electric locomotives	52,000 bbls per day
TOTAL	317,000 bbls per day

For the 265,000 barrels of heavy fuel, the oil-burning steam locomotives performed about 18% of the work done by the American railroads. The Diesel fuel consumed by Diesel-Electric locomotives in 1947 was 1% of the total consumption of all petroleum products. For these 52,000 barrels of Diesel fuel per day, the Diesel-Electric locomotives performed about 19% of the work done. The balance of the work, some 63%, was performed by coal-burning steam locomotives and electric locomotives using central station power, much of it coal generated.

If all of the work done on the American railroads in 1947 had been performed by Diesel-Electric locomotives, the total consumption of diesel fuel would have been about 256,000 barrels per day. This amount is less than 5% of the total consumption of petroleum products in all fields in 1947, *and is less than the quantity of heavy fuel consumed by the oil-burning steam locomotives in 1947.*

According to the reports of the Bureau of Mines and American Petroleum Institute, automobiles, trucks, buses, farm tractors, and airplanes which consumed approximately 2 million barrels of gasoline per day in 1947, collectively are the principal users of petroleum products. Users of residual fuels and asphalt consumed about 1,550,000 barrels daily. The oil home heating equipment took about another 580,000 barrels per day. Altogether, the 1947 liquid fuel consumption was divided as shown in Table A.

Much of the misunderstanding concerning the overall fuel situation has come about from the argument that diesel-electric locomotives consumed 633% more fuel in 1947 than in 1941. Yet this 633% represents an increase of from 7,100 barrels per day to 52,000 barrels daily or a net increase of 44,900 barrels per day. Meanwhile over the same period, the increased consumption by other users of liquid fuel is shown in Table B.

The increased consumption of petroleum products between 1941 and 1947 by all users other than railroads totaled 986,000 barrels per day. The 44,900 barrels daily increase in diesel fuel consumption by American railroads is by comparison but a drop in the bucket.

The railroads of our country are recognized as an indispensable facility for the well being of industry, agriculture, and communication without which present standards of living would be impossible. They are also a vital necessity for the national defense in time of war. To say that the railroad industry should continue to supply such facilities without an adequate financial return is to expect the impossible. Yet the railroads are confronted with a rigid income and expense structure. They cannot offset rising costs of material and labor by increasing the price of their services, until approval is secured from regulatory bodies because of strict government regulation.

The net effect of these rigidities and other factors, on the railroads' financial structure over the past twenty years has been disastrous. During the decade of the '30's, one-third of the railroads were insolvent and in receivership. Over the 20 year period, a net return on invested capital of slightly over 3% per year for all railroads has been insufficient to attract new capital for improved services and the extensive modernization of facilities.

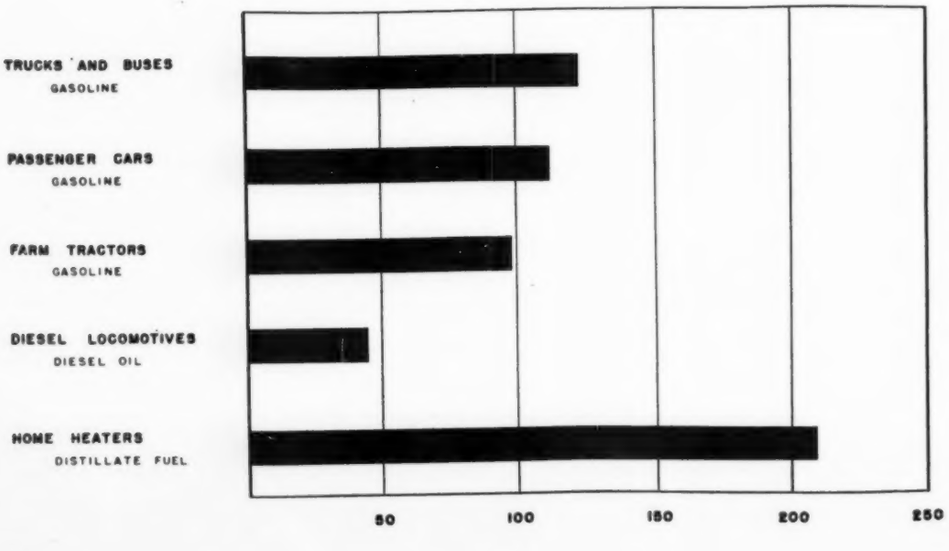
Until the diesel locomotive arrived on the scene in 1936, the railroads appeared powerless to accomplish the rehabilitation of their properties

* Class I railroads including switching and terminal companies.

** A Report by the General Motors Corporation

TABLE A

INCREASE IN PETROLEUM PRODUCTS CONSUMPTION
1941-1947
THOUSANDS OF BARRELS PER DAY



and the reorganization of their finances within the limitations imposed by government control of income and union control of wages. Predictions were rife that the railroads of America were headed for outright government ownership. Today, the picture is quite different. So effective have diesel locomotives been in reducing costs and improving services that they have literally paid for themselves out of direct savings over steam operation while at the same time they have built increased traffic and revenue for railroads.

In switching service, diesel locomotives during the year 1947 performed over 32% of the switching work done at savings up to 40% per annum on their first cost. In mainline freight service since 1940, diesel locomotives have taken over the heaviest and fastest freight movements with savings up to 25% per annum on their first cost. Oftimes, because of higher speeds, the ability to haul longer trains, and greater availability, one diesel locomotive will replace between four and six steam locomotives.

The two principal ways by which diesel locomotives effect direct economies over steam are in fuel consumption and in repair costs. In 1947, according to the Interstate Commerce Commission reports, the total fuel bill for steam locomotives was approximately $582,000,000 for coal and fuel oil combined. Had the work performed by these steam locomotives been handled by diesel locomotives at the same cost recorded by diesels then in operation, this fuel bill would have been more than cut in half with savings of $340,000,000.

During the year 1947, the railroads spent $527,000,000 on the repair of steam locomotives. Based on the maintenance and repair costs of diesels then in service, 40% of this amount, or $210,000,000 could be transferred from operating expense to earnings by complete dieselization. The combined savings in fuel and repair costs for the year 1947 would have totaled $550,000,000.

Not only does the diesel locomotive provide means for substantial improvement in railroad service and financial structure as outlined above, but it is the most efficient and economical way to transform liquid fuel into useful work. Diesel locomotives haul goods with five times the fuel efficiency of steam locomotives. When hauled by diesel locomotives a loaded freight car weighing 40 tons, or more than 20 times the weight of the modern automobile, travels 16 miles per gallon of diesel oil at an average speed of 22 miles per hour. Thus in the whole vital overland transportation service real conservation of our petroleum resources would be accomplished by dieselization of our railroads.

We, who have pioneered the manufacture of diesel locomotives for the American railroads, are just as interested in the future of the liquid fuel situation as anyone in government, industry, or the general public. We earnestly support any proposals for the relief of this condition and for the conservation of our petroleum reserves which are for the greatest good of the greatest number of our people. Specifically, in order to obtain an increase in the supply of liquid fuel, the oil industry must expand its refinery capacity with modern equipment capable of getting the most fuel possible out of a barrel of crude oil. This need has been recognized by the oil industry and additional refining capacity is being provided just as fast as equipment can be procured, requiring an investment running into billions of dollars. Therefore, there is great risk in formulating any long-term transportation policies based upon conditions which we have every right to believe will be of short duration.

The consumption of gasoline by automobiles, trucks, buses, and airplanes in 1947 has doubled since 1930. Not only have the number of vehicles increased, but in the case of automobiles the consumption of gasoline per car per year has increased from about 500 gallons to about 700 gallons. If the miles per gallon of existing cars and trucks could be increased by just one mile per gallon, the saving in gasoline consumption would amount to about 150,000 barrels per day. Diversion of 150,000 barrels per day of cracking stock to produce diesel fuel would provide three times the total 1947 railroad requirements.

But an attack on the fuel economy problem is needed. General Motors has long been working on the development of high compression engines to use high octane gasoline. Test automobiles with engines producing an immediate fuel saving of 20% have been in operation for hundreds of thousands of miles. The potential savings using this type engine aggregate 400,000 barrels of gasoline per day which is equivalent to eight times the amount of diesel fuel consumed in 1947 by the American railroads.

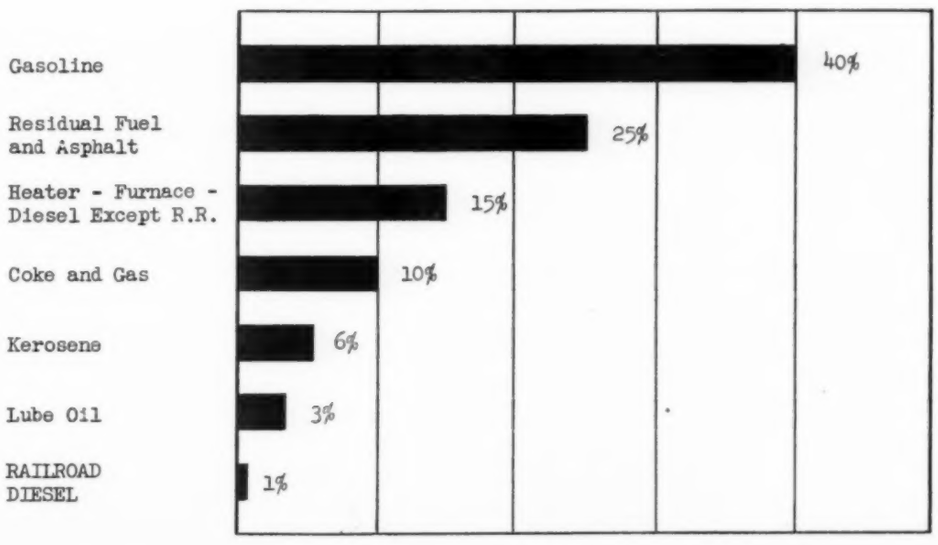
It has been stated by some leaders in both government and industry that the shortage of liquid fuels and the huge availability of coal warrant the adoption of a transportation policy favoring the continued use of coal-burning steam locomotives by our railroads instead of diesel-electric ones.

It has been shown that this national policy, it adopted, would actually increase the use of liquid fuel unless both oil-burning steam and diesel locomotives now in use were disposed of and the entire railroad operation conducted by coal-burning locomotives. If such a backward step were seriously contemplated, a review should be made of the transportation problems during World War II and how they were solved. Diesel freight locomotives, because of higher speeds, the ability to move heavier tonnages, and their greater availability for work, handled as much war freight on the trunk lines west of Chicago as could have been handled by an additional newly built railroad from Chicago to the Pacific Coast using steam power alone. So effective was the war work performed by the diesel freight locomotive that its manufacture commanded the highest priority on steel and production was continued at capacity throughout the war in spite of the acute shortage of both manpower and material.

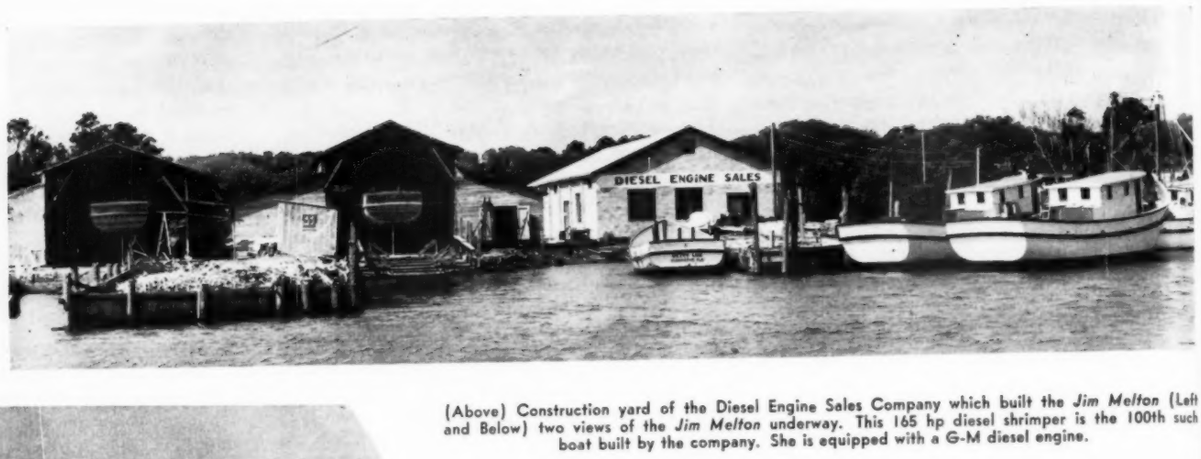
For many years, it has been estimated that our proven oil reserves would be depleted in 12 years. While the use of petroleum products is at an all-time high, the discovery of new fields has more than kept pace with current demands so that proven reserves have been steadily increasing. If all the diesel-electric locomotives in operation on the American railroads today were to be scrapped tomorrow, this 12 year reserve would be extended less than 45 days. Assuming 100% railroad dieselization as of today, the oil reserves would be depleted just 7 months earlier.

To insist that the railroads invest their money in coal-fired steam locomotives which were recognized as obsolete 10 years ago in the light of the foregoing conditions, is like asking the automobile companies, because of the shortage of steel and fuel to return to the manufacture of carriages and wagons. That can not happen and will not happen, nor will it happen to the railroad industry, regardless of the temporary pressures which may be brought to bear upon it.

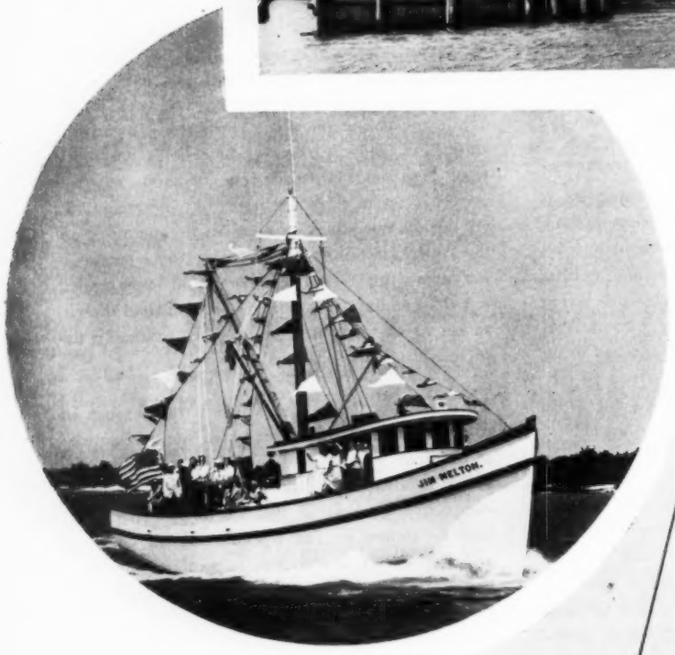
TABLE B



The JIM MELTON...60 foot



(Above) Construction yard of the Diesel Engine Sales Company which built the *Jim Melton* (Left and Below) two views of the *Jim Melton* underway. This 165 hp diesel shrimper is the 100th such boat built by the company. She is equipped with a G-M diesel engine.



Diesel Shrimper . . .

By WILL H. FULLERTON

A BRAND NEW boat dipped her bows respectfully at the annual Blessing of St. Augustine's shrimp fishing fleet held recently at Florida's most venerated old city. The new boat was the *Jim Melton*, a trim 60-footer completed just in time to participate in this impressive ceremony.

Blessing of the fleet follows the end of the closed season and opens the spring fishing. The fleet cruises in gala procession to the dock nearest the ancient cathedral, and the dedication and sprinkling of Holy Water on the boats is performed by the Bishop.

The *Jim Melton* was the hundredth shrimper to be built by the Diesel Engine Sales Co., Inc., of St. Augustine, Florida, and represents the builders' ideas of what a good shrimper should be. Shrimp fishing is big business in the South. Nearly two-thirds of the entire U. S. catch of shrimps is taken off the coast of Louisiana.

More and more shrimping boats are being placed in service in this profitable business which sees a catch of almost 200,000,000 lbs. a year. We all know how much a pound of fresh or frozen shrimp costs so the revenue involved should be simple to figure out.

The new shrimper, *Jim Melton*, is under the watchful eye of the industry for she incorporates several modifications of design. These changes were incorporated after careful studies of shrimpers in many southern ports and the actual operating experiences of their operators.

The reasons which brought about the introduction of this new shrimper are well worth recording, as this gives an insight on how the design developed. Boats for the southern shrimp fishing industry, while basically very similar to each other, differ considerably in some of those important details which can make a big difference in the over all operation, and in a year's net results.

Speed is one factor. This means saving time shuttling to and from the fishing grounds. Speed, however, must not be judged by results of trial runs under favorable conditions, but by the average in all kinds of weather during a season's operations. Speed must be obtained without any noticeable power increase over that of the average boat, or the capital investment and operating costs may overstep the bounds of competitive economy. To accomplish this, it means a well-designed and strongly built boat with all the details thoroughly worked out and reduced to the simplest elements yet keeping the first cost down to a workable level.

Some shrimpers are built by rule-of-thumb, as it were. Some builders use rough working drawings, other take dimensions from scale models carved from wood. Rarely are two boats alike.

For its new design of a shrimp fishing boat the Diesel Engine Sales Company engaged a well-known firm of naval architects, Tams, Inc., of New York, to study the requirements of Atlantic Coast and Gulf fishermen in close consultation with the builders and with boat owners.

The hull has an over-all length of 60 ft. 3 in. a waterline length of 55 ft. 10 inches, a beam of 18 feet, with a 8-ft. 2 inch moulded depth and a draft of 5 ft. 6 inches to 7 feet depending on load. Power is provided by a General Motors six cylinder series 71 diesel driving a three blade propeller through a 4.5 to 1 reduction gear and hydraulic clutch. The engine delivers its rated output of 165 bhp. at 1850 rpm. The vessel is designed for 10 to 11 knots with this power installation—good speed for a shrimper.

Hull changes included in this new design are smoothed out lines, a finer entrance and a sharper round to the forefoot than has been customary in craft of this type. There also is a slight flare to the forward sections which will mean a dryer boat. The keel is built of long 9 x 11 inch leaf pine and projects 10½ inches below the planks. It has a 1½-ft. drag when the boat is light. The frames are oak 2 x 4 inches steam bent and set on 12 inch centers. The planking is "six-four" cypress and is laid without caulking. On either side of the hull, below deck, there are two 750 gallon fuel tanks which will carry enough fuel for 15 days normal operation.

Sleeping accommodations are provided for three men—the skipper in the deck house, and two swing bunks in the forecastle. Shrimpers from this yard were among the first to have a toilet room and locker, which is between the forecastle and the engine room. Aft of the fish hold, there is a lazarette. In the galley there is a butane gas range, ice box, sink and mess table.

Under ordinary conditions, the engine is controlled from the pilot house, there usually being nobody down below in the engine room while fishing. This makes for efficiency.

There is a mast with one main boom and two small side booms to handle the nets. The drive for the hoist consists of a shaft running alongside the engine from the power takeoff, with a chain drive up to the deck.

For charging the storage batteries for starting and lighting current supply and bilge pump operating there is an auxiliary gasoline driven 32 volt generating unit. There is also a 35 hp. power take-off on the forward end of the main engine for operating the fishnet hoist and booms. The tank for the gasoline is installed on deck to prevent fire hazards. On deck there also is a 25 gallon tank for lubricating oil. All piping and fittings in the engine room are of brass.

The engine room is arranged further forward than is the case with the majority of shrimpers, so that when 15 or 20 tons of fish and ice are aboard, the hull is trimmed at the best point for proper operation.

No pains have been spared in making this new design a considerable advance over existing boats, yet within the purse limitations of the average fisherman. It is a sensible design.

Four of the 100 shrimping boats built by the Diesel Engine Sales Co.

High Pressure Supercharging of Internal Combustion Engines

By RALPH MILLER*

THE author, who has conducted extensive research with high pressure supercharging for internal combustion engines, ventures to prophesy that in the very near future we will look back upon present day engine designs as obsolete.

The ever increasing engine construction cost, the high price of fuels and the pressure of competition from other types of prime movers will force an acceleration of high pressure supercharging developments. While methods and systems of providing engines with high pressure air has been the subject of a number of recent technical papers and patent applications, no adequate analysis has been made of engine performance in relation to the pressure and temperature of the air charge.

With some fifteen years of experience with practical applications of the Buchi supercharged four cycle engine, we might be permitted to use that, rather than the non-supercharged version, as a basis of comparison of pressures and temperatures which will be encountered with high pressure supercharging. A standard Buchi supercharged four cycle engine might be assumed to be rated at 120 bmep. and having the fuel injection adjusted to operate with a maximum combustion pressure of 765 psi. absolute with a compression volume ratio of 13½ to 1.

With efficiently cooled, well designed pistons and the use of the best known material, Buchi supercharged four cycle engines without intercooling may be rated at 120 bmep. with good reliability at sea level and with ambient temperatures up to 90° F. With this as a basis, the maximum rating bmep. for high pressure supercharging may then be calculated as follows:

First condition: Pressure and cycle mean temperature limited.

(a) The maximum combustion pressure is to be limited to that of the Buchi supercharged engine.
(b) Cycle mean temperature limited to that of the Buchi supercharged engine.

If the Buchi supercharged engine is limited to 765 psi. abs., the maximum permissible supercharging pressure will be 10 psi. gauge as this will give about 770 psi. compression pressure and all combustion will be at constant pressure. Reference to graphs in Fig. I shows that when the supercharging pressure is increased from 4 to 10 psi. gauge without changing the temperature T_1 at beginning of compression stroke, the mip. increases from 140 (120 + 20) to 172. The gain in bmep. is from 120 to 150 (172 – 22). However, this rating requires that the air enter the engine at the same temperature, but since with a blower efficiency of 77%, the air at 10 psi. gauge will have a temperature 63° F. higher than when at 4 psi. gauge, intercooling will be necessary.

Second condition: No limit on maximum combustion pressure-cycle mean temperature limited.

(a) The combustion pressure is permitted to increase in the ratio of the absolute supercharging pressure.
(b) The cycle mean temperature is held to the limit reached in the Buchi System at 4 psi. gauge pressure and 120 lbs. bmep.

When, with increasing supercharging pressures, the fuel injection is so adjusted that the ratio of combustion to compression pressure is kept constant, the mip. at constant cycle mean temperature increases as the absolute supercharging pressure, if the temperature at beginning of compression is also kept constant. Thus, when the supercharging pressure is increased to 10 psi. gauge, the combustion pressure will be

$$\frac{24.7}{18.7} \times 765 = 1000 \text{ psi. abs.}$$

Then if the supercharging air is intercooled to enter the engine at the same temperature as in the Buchi System, the mip. will be

$$\frac{24.7}{18.7} \times 140 = 185 \text{ psi.}$$

with the same cycle mean temperature.

As in the system under "First Condition," intercooling is required to obtain this rating of 185 mip. To match the temperature conditions of the Buchi System operating at 4 psi. with 77% blower efficiency and 90° F. ambient temperature, intercooling will be carried to 140° F. The graph in Fig. II has been plotted to show the change in mip versus air charge temperature for constant cycle mean temperature.

Without intercooling, the air charge temperature at 10 psi. supercharging would be 203° F. and the 185 mip. rating carried in the "Second Condition" example would be reduced to 146 which is only 4 above the Buchi System although the maximum pressure has been increased to 1000 psi.

If under "Second Condition," the supercharging pressure is carried at 1 atm., the maximum combustion pressure will be 1200, and with air intercooling to 140° F., the mip. increases to 220 psi. for constant cycle mean temperature. Without air cooling, the air charge temperature would rise to 245° F. and a reduction in the mip. to 143 psi. would be required for constant cycle mean temperature. This clearly shows that high pressure supercharging without intercooling produces practically no increase in output. Lines 1 and 2 in Fig. III show the increase in mip. with supercharging pressure with cycle mean temperature. In Fig. IV, Lines 1 and 2 show the mip. which will be obtained when operating on the Miller High Pressure System, (Ref. 1) with constant and increasing maximum combustion pressures respectively and cycle mean temperatures equal to the Buchi supercharged engine at 120 bmep. load and 4 psi supercharging pressure. The curves are based on an expansion ratio of 1.4 from the highest to the lowest pressure in the cylinder during the air intake stroke. The air enters the engine at 140° F. at all supercharging pressures. The temperature at the beginning of the compression stroke is then 60° F. lower than in the non-expanding cycles shown in Figure III.

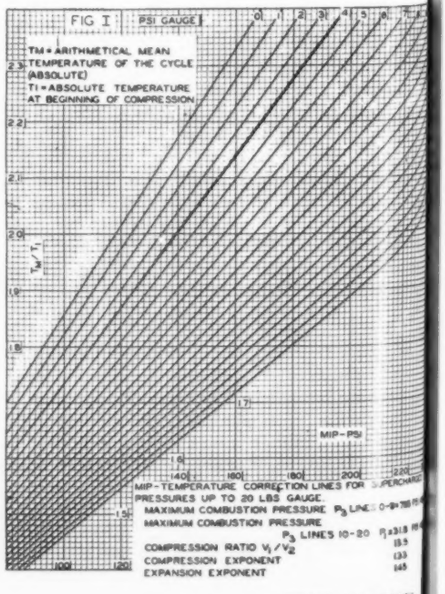
If we select a supercharging pressure of 10 psi. gauge and admit the air at 140° F., the ratings of the various systems may be tabulated as follows:

	Figure	Line	MIP	BMEP
Non-expanding cycle	III	1	172	150
Non-expanding cycle	III	2	185	162
Internal expansion cycle	IV	1	203	179
Internal expansion cycle	IV	2	219	194

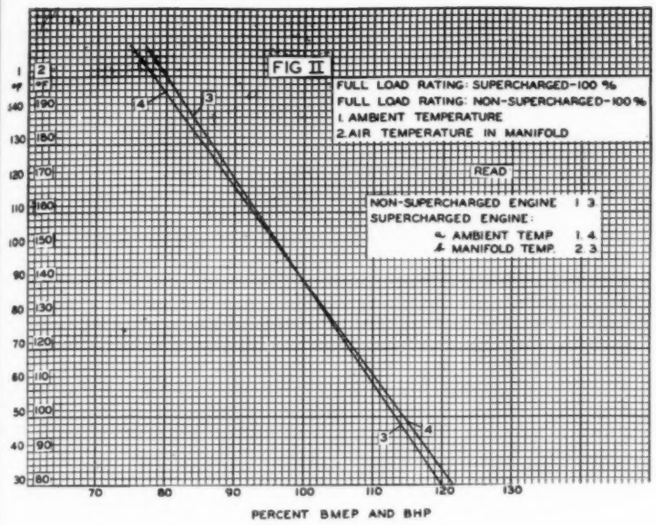
The rating lines in Figs. III & IV are plotted on the basis that combustion efficiency is maintained with increased supercharging pressures. That is, the expansion ratio is maintained and the rate of after-burning is unchanged. With a fuel consumption of .291 lbs./ihp./hr. the air fuel ratio is 27.5 at all loads on line 2, Figure III. The air fuel ratio is 25 for all mip's on line 2 in Fig. IV. The maximum theoretical increase in output versus pressure is shown. Any loss in combustion efficiency will increase the slope of the lines and diminish the rate of power increase.

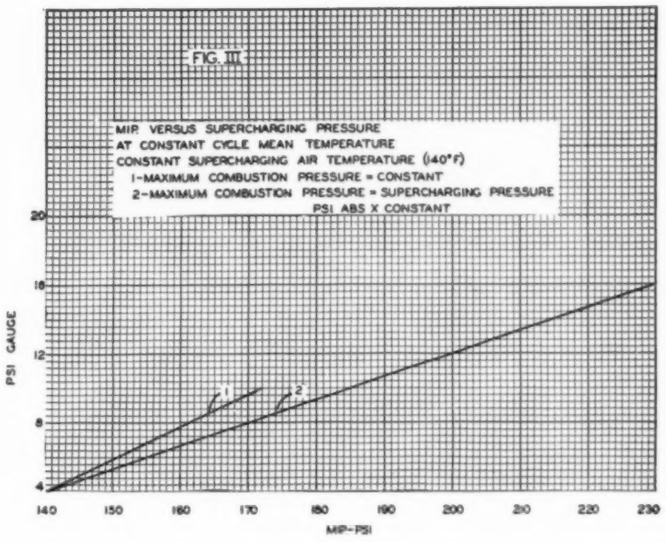
High pressure supercharging is not just a matter of increasing the pressure and controlling air temperatures but involves development of a fuel injection system which will insure the combustion efficiency of the low pressure supercharging system which is used as a basis.

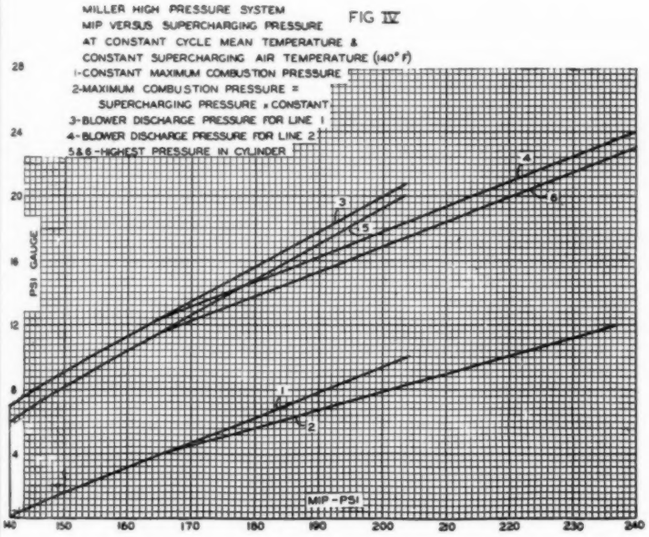
The output of the internal combustion engine is

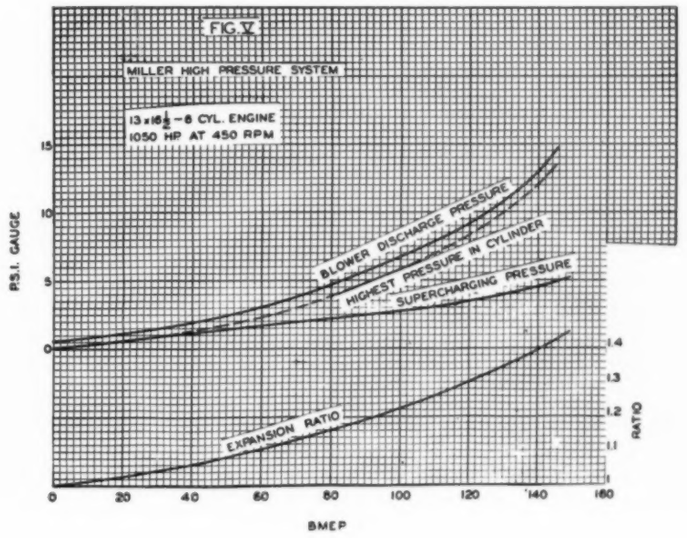


* *Consulting Engineer.*









limited by the temperatures of the internal surfaces of parts, such as piston rings, piston crowns and the upper part of the liner. While there is a definite relation between cycle mean temperatures and surface temperature, the use of the former in this analysis may be questioned and need some clarification. The cycle mean temperature can be readily calculated either from the actual diagram, if one is available, or from an ideal diagram. (Ref. 2).

The effect of increase in charge density upon rate of heat flow to the metal surfaces has not been thoroughly investigated in the higher pressure ranges. However, measurements of heat flow to the water jackets conducted with natural aspiration and 4 psi. supercharging pressure have failed to show any increase in heat transfer rate from gas to metal surfaces, when loads were adjusted to equal calculated cycle mean temperatures. That is to say, that when the pressure at the beginning of the compression stroke is increased from 14.7 to 18.7 psi. abs. without change in temperature at beginning of compression, the mip. is increased in the ratio of 18.7 to 14.7 with the same rate of heat flow to the cooling water which, of course, shows that the internal surface temperatures are the same at these two conditions. Since the cycle mean temperatures are equal, this proves that the rate of heat transfer from the hot gases to the metal has not increased with the supercharging pressure within this range.

Fig. V shows the pressures versus load recorded on a six cylinder 13 x 16½ engine at 450 rpm.

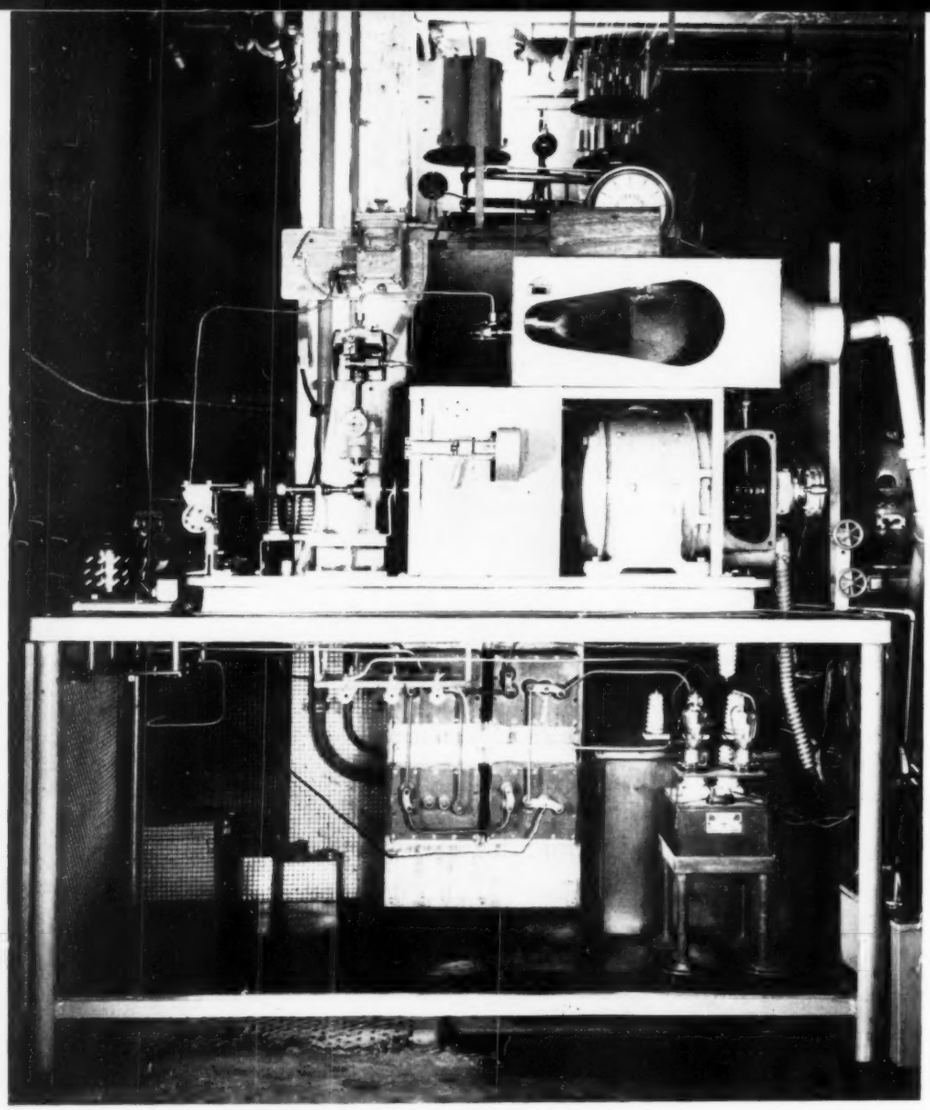
This engine is rated on line 2 in Fig. IV at 4 psi. supercharging pressure at 165 mip. At this load the maximum combustion pressure was 800 psi. and a fuel rate of 34 lbs./bhp./hr. was recorded. The closing point of the inlet valve changes automatically with load from 30° bbc. at full to 10 adc. at no load. Thus with constant temperature in the air inlet manifold the internal expansion cooling of the air charge decreases with decrease in load, the temperature at the beginning of the compression increases and light load operation is improved. The foregoing covers supercharging pressures obtainable with single stage centrifugal blowers.

Output for higher pressures can be extrapolated from Figs. III and IV. But to utilize these high pressures engines must be designed to carry greater bearing loads per unit piston area and combustion pressures more than double.

The compressor equipment might consist of a Roots type blower driven from the engine and a high pressure turbocharger whose centrifugal blower will be the second stage compressor supplying air to the intake manifold. With pressure ratios of 1.5 and 2 respectively this would produce an intake manifold pressure of about 29 psi. An exhaust gas turbine driven two stage blower capable of operating at these high pressures would eliminate the power loss associated with an engine driven first stage blower, but such units have not be developed for commercial use.

Reference 1: "Supercharging and Internal Cooling Cycle for High Output" ASME Oil & Gas Power Division, Milwaukee Meeting, 1946.

Reference 2: "Rating Supercharged Engines on the Basis of the Mean Temperature of the Cycle" ASME Annual Meeting New York City, 1942.



Stroboscopic spray booth for pump and injector studies at University of California Diesel Laboratory. Note injector spray caught by stroboscope.

Speakers at the D.E.M.A. Conference at Berkley: rear row, left to right: Otto H. Fischer, president of the Union Diesel Engine Co.; Harvey T. Hill, executive director D.E.M.A. Front row, left to right: Roy A. Hundley, chief engineer, Enterprise Engine & Foundry Co.; W. G. Nostrand, executive engineer Winslow Engineering Co., and S. W. Newell, vice president, Union Diesel Engine Co.

"DEMA" GOES TO COLLEGE

Pacific Coast Educational Conference Brings Out Full California Manufacturer And Engineering Educational Contingents

By F. HAL HIGGINS

THE San Francisco Bay area has a long, deep engine history that covers every phase of the consumer demand from marine to mountains from the earliest steam to diesels. Hence, the University of California campus at Berkeley was a sound and happy choice for the Pacific Coast Educational Conference sponsored by the Diesel Engine Manufacturers Association, University of California and California Research Corporation. Some forty were in attendance.

The morning session at the University Engineering building included talks by Prof. Carl J. Vogt, chairman, and head of the University of California Mechanical Eng. Div., who introduced President Otto H. Fischer of the Union Diesel Engine Co., Oakland. Mr. Fischer is also a vice-president of DEMA, and in presiding over the morning meeting handed out the sage advice of a half century of experience in the engine building industry that covered both gasoline and diesel. "Why the Diesel Engine Industry Is Interested in Better Diesel Engine Education" was the title of his talk. Fischer pointed out that the gasoline engine had not received the attention of educators during its development that had brought a tremendous revolution to the world. The automobile and airplane, however, had finally changed this engineering education outlook on such power. World War

I had brought a realization by educators to the importance of the internal combustion engine's place in the world. All of the diesel industry needs the best training and education for its engineers that can be had, Fischer summarized.

Harvey T. Hill's train from Chicago was running on railroad time, of course, while the program at Berkeley was on daylight time; hence, Hill was late and gave his "What the Diesel Engine Industry Is Doing to Help the Schools" talk after his assistant had skimmed the high spots from his talk in a pinch-hit role. Preparation of pamphlets by DEMA for distribution to the colleges asking for these for their engineering students has already progressed to important results for both colleges and the industry. He gave "Boss" Kettering, famed GM engineer, credit for starting the idea of such cooperation between colleges and industry. The best authority in each special field touching diesel engines is called upon to write only his end rather than having one author write the entire text book on diesel engines, the DEMA official pointed out. Three pamphlets will soon be published and will be distributed: W. P. Green, Illinois Institute of Technology, writing the first; E. B. Watson, Cornell University, the one on Diesel Engine Lubrication; while Fuels and Fuel Injection will be handled by Kalman De Juhasz of Pennsylvania State College.

The industry is eager to help schools with their problems touching diesel engines, said DEMA's speaker. Also, the Association officials want to know the educators better in order to better render them such services as the industry has to offer. Roy A. Hundley, chief engineer, Enterprise Engine & Foundry Co., San Francisco, talked on "Making an Engineer of an Engineering Graduate." Hundley said he found the engineering grad wanting to be an executive and not wanting to be long in getting there from his start. War casualties, he thought, had been a big factor in changing the college engineering student's viewpoint on getting promoted rapidly from low ranks to top. Also, the great number of jobs available to the college graduate today makes it easy for him to pick and choose something to his liking rather than having to settle down to a long grind as in pre-war days of college graduates. "Knowledge is wonderful, but without experience, it is not so good," summarized Hundley. There is a sales glamour that attracts a big share of the college engineering grads today and few want to start on the drafting board where pay is not so attractive as in sales work, he found. The industry must train these college men, however, and he thought that the Westinghouse and BE methods were probably the best for the big concerns who could afford such careful, thorough and expensive systems. For most of the diesel firms, he thought, the training must fall on department heads. Some of the old heads and supervisors believe in deflating these young college men and handle them sternly with insistence on precision.

Yet these young fellows should be given freedom of expression. The college professors make a definite contribution toward molding the attitudes of students. The manufacturers' catalogs have a real place in the education and training of engineering students, he added. Bearings, V-belts, power transmission problems can be helped in solving by use of these manufacturer catalogs.

The young engineer must early learn the value of a dollar, bluntly warned Union Diesel's vice-president, S. W. Newell, in opening his talk on "The Challenge Offered Young Engineers by the Diesel Engine Industry."

Summarizing his hard-hitting facts laid down from experience in the Union factory, Newell left these points:

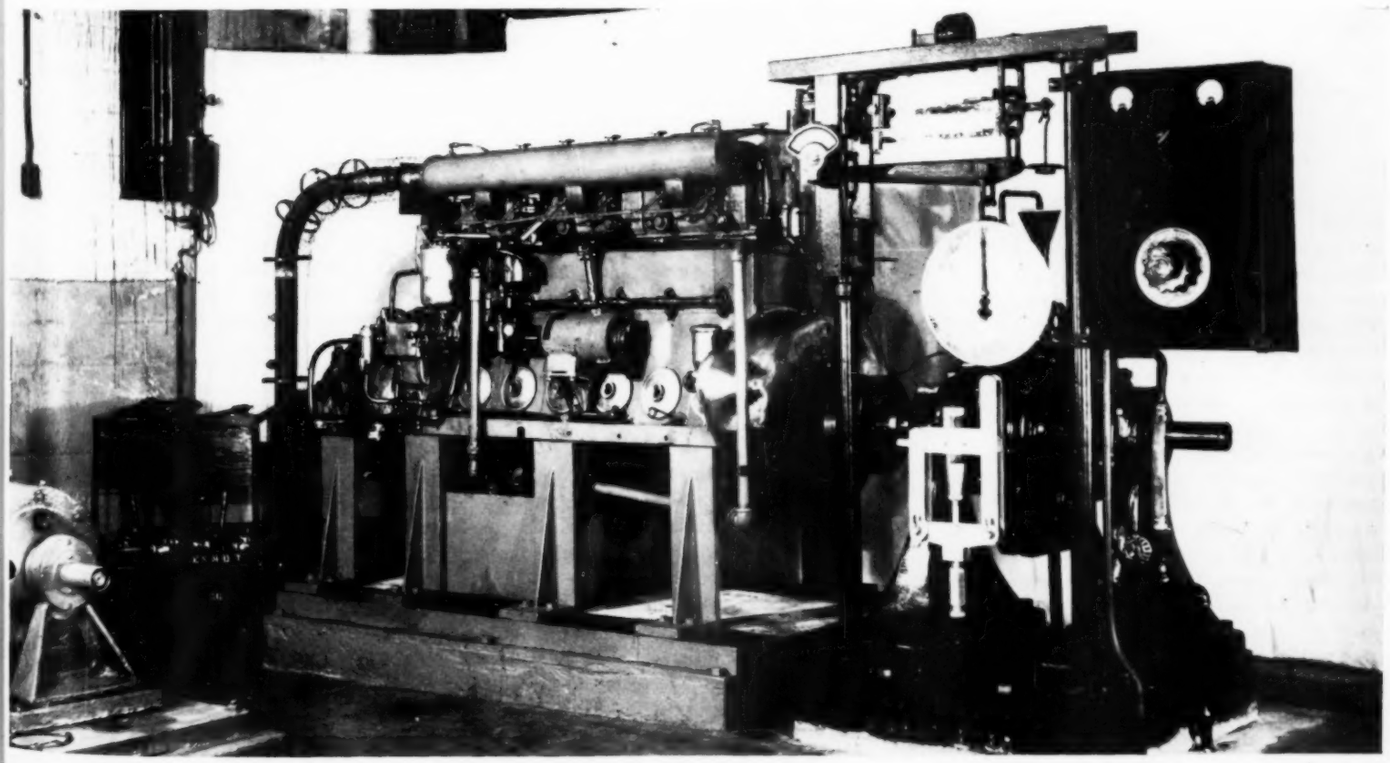
1. Learn value of the dollar.
2. Select the proper job.
3. Hard work is a must in the diesel industry.
4. The sheepskin is only a ticket to practical training.

Winslow Engineering Company's executive engineer, W. G. Nostrand, gave a very technical and complete paper on Lubrication of the Diesel Engine from the Filter Manufacturer's Viewpoint. Prof. Vogt apologized for the jumbled arrangement the visitors would find the University's diesel laboratory, as it was still in the process of being moved and installed for future use. But visitors were agreeably surprised at the sound approach Vogt was making to diesel problems as seen in the special equipment he and his staff had designed and built for testing diesel engines.

Following a luncheon at the University International House, some 40 visitors toured the diesel laboratory followed by round table discussion of undergraduate and graduate laboratory procedure.

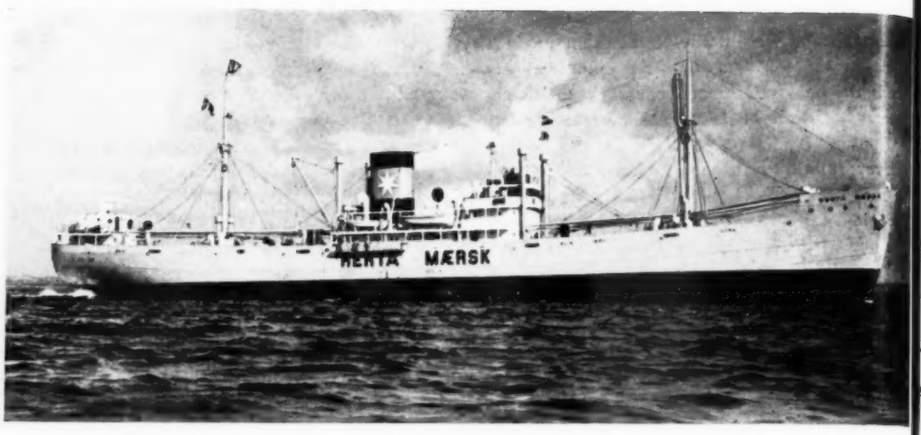
Over at Richmond, 10 miles away, another program was given at the California Research Corporation, Standard of California's laboratory.

6-cylinder Buda diesel on test stand at University of California diesel laboratory.



HERTA MAERSK

By DOUGLAS SHEARING



Diesel freighter *Herta Maersk*. She is 359 feet overall with a gross tonnage of 4325 tons and a cruising speed of 12 knots.

RECENTLY the single-screw cargo motor vessel *Herta Maersk* went on her trials. The ship has been built to the order of Mr. A. P. Moller's Shipping Company "Svendborg" and it is the last of a series of newbuildings—the so-called "Hansa Program"—ordered with Danish shipyards during the war. This is the fourth "Hansa" ship that has been taken over by these owners.

The M.S. *Herta Maersk* has been built as a closed shelter decker to British Corporation, and the main data are as follows:

Length overall	359′-1″
Length between perpendiculars	333′-0″
Beam	50′-10″
Depth to upper deck	30′-4″
Depth to second deck	21′-9 13/″
Gross tonnage	4325 tons
Deadweight	5875 tons
Draught	22′-8½″
Speed on trials	About 12½ knots

The ship has 4 cargo holds with a capacity of 315,720 cu. ft. grain corresponding to 285,850 cu. ft. bales. At the aft end of hold No. 2 and alongside the tunnels in hold No. tanks have been arranged for fuel oil or vegetable oil. The whole double bottom may carry fuel oil or water ballast. The cargo holds are served by eight 3 ton and four 5-ton winches with twelve 5-ton derricks, and further by one 22-ton derrick. All winches as well as windlass and steering engine are electric.

The accommodation is arranged in a deckhouse amidships round the engine casing and in the tweendeck aft. In the structure amidships, the house on the bridge accommodates the wireless operator, as well as wireless office and chartroom. The house on the boat deck accommodates the captain, hospital, and deck officers, and furthermore the gyro compass room is found here. In the front part of the deckhouse on upperdeck are officers' mess and smoking salon, cabins for deck and engineroom officers, galley staff, crew's messrooms, pantry and galley with oil-fired galley range. The crew's accommodation consists of single and two-berth chambers, washing room, and a smoking salon located on the boat deck aft. The entire accommodation is painted in light shades, it is well lighted and ventilated and has modern furniture.

M.S. *Herta Maersk* is fitted with the best of nautical instruments and equipment, such as radar installation of the "Raytheon" type, echo sounder, gyro compass, magnetic compass, log with electric transmission, wireless installation and direction finder, as well as automatic pilot.

The machinery was built to British Corporation's Rules MBS with ice strengthening, and satisfying Danish law requirements.

The main engine is a Burmeister & Wain direct reversible, single-acting, two-stroke, 5-cylinder crosshead engine with airless injection, cylinder diameter 24.4 in., stroke 45 in. Normal output 2,800 ihp. corresponding to 2,280 bhp. at 112 revolutions per minute.

This engine type is one of the results of the development which took place before the war in regard to B&W two-stroke engines, and the engine, which essentially corresponds to the B&W standard designs, has in two principal points been a model of the single-acting, two-stroke crosshead engines. In accordance with B&W practice the rotating scavenging air pumps are fitted on the rear side of the engine, which arrangement gives the shortest possible engine.

The engine is built with short pistons and cylinder liners giving the least possible height of the engine and retaining the pure crosshead principle that cylinders and crankcase should be kept apart.

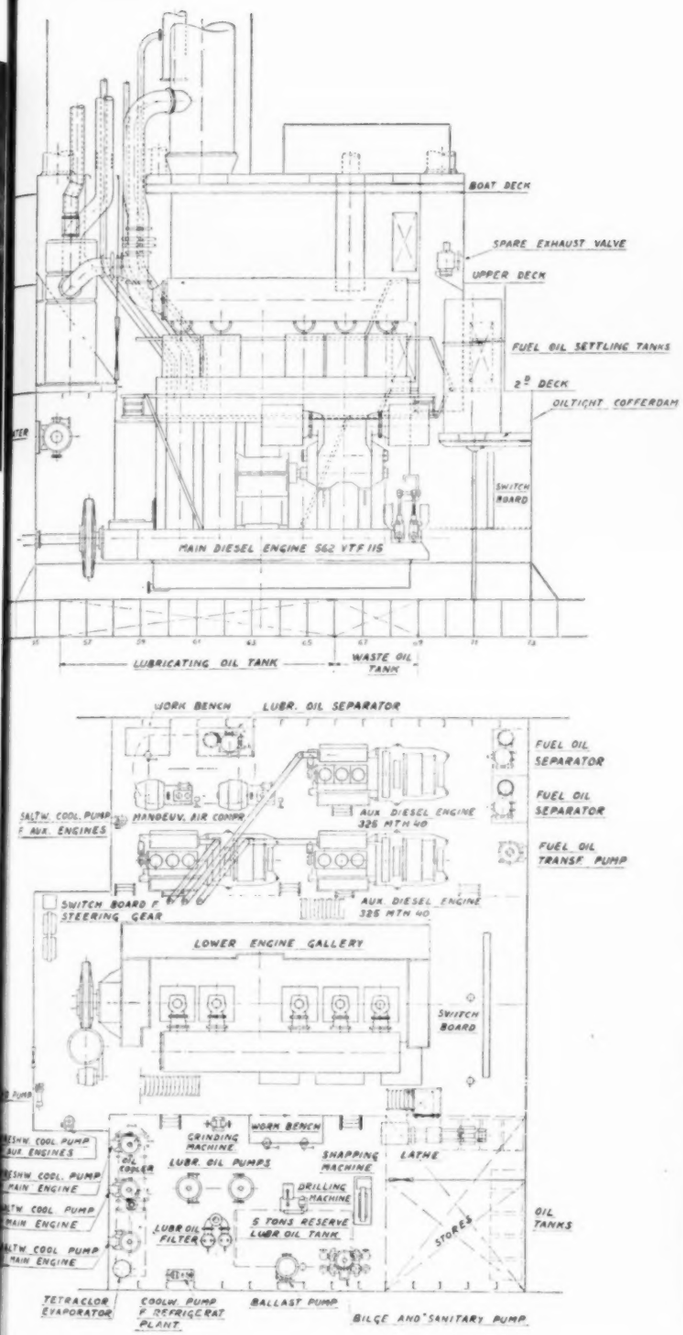
There are three single-acting, 4-stroke, 3-cylinder trunk piston auxiliary engines with airless injection, each direct coupled to a generator of 100 kw. at 220 volts. The cylinders have a diameter of 9.6 in., a stroke of 15.9 in., and an output of 150 bhp. per engine at 425 rpm.

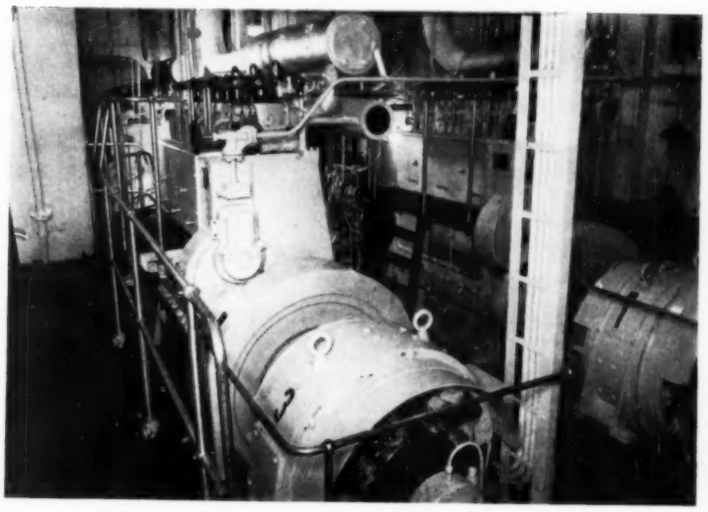
All large pumps are vertical and direct coupled to the electric motors by resilient couplings. There are two lubricating oil pumps, each having a capacity of 3000 cu. ft. per hour at a pressure of 3.5 atm., further two sea water cooling pumps each having a capacity of 100 cu.m. per hour at a pressure of 2.1 atm., and a fresh water cooling pump having a capacity of 100 cu.m. per hour at a pressure of 2.1 atm.

The auxiliary engines have a common fresh water pump and a common sea water pump, each having a capacity of 8000 gph., to be used in port. The lubricating oil is drawn from the bottom tank beneath the main engine; it is discharged through the filter and lubricating oil cooler to the main engine, where it is used partly for cooling of pistons, partly for lubrication of bearings, whereupon it flows back to the bottom tank. There is an oil cooler made of steel plate and having cast iron covers, tube plates of brass and tubes of yellow metal, and furthermore a fresh water cooler of the same type. The fresh water pump draws from the main engine and discharges through the fresh water cooler back to the main engine. The system is closed, and in the casing an expansion tank of about 1 cu.m. is fitted. The sea water cooling pumps draw from the sea and discharge through oil cooler to fresh water cooler and overboard as waste.

Other pumps include a vertical, self-priming centrifugal pump of 150 cu.m. per hour, acting as ballast pump, a 2-cylinder plunger pump of 2 x 20 cu.m. per hour, acting as bilge and sanitary pump, and a gearwheel pump of 30 cu.m. per hour at a pressure of 3.6 atm., acting as fuel oil transfer pump for constant service.

Starting air for the diesel engines is supplied by two 2-stage maneuvering air compressors, each having a capacity of 2 cu.m. intake air and direct coupled to an electromotor. There is a starting air receiver, having a capacity of 7.5 cu.m. at a pressure of 25 atm.

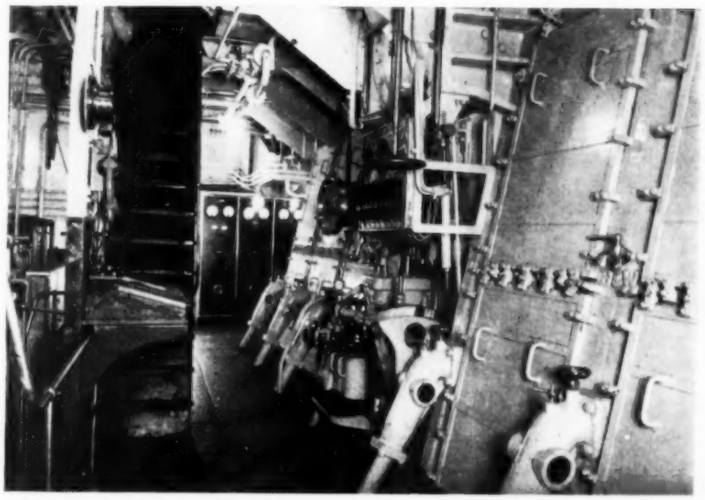




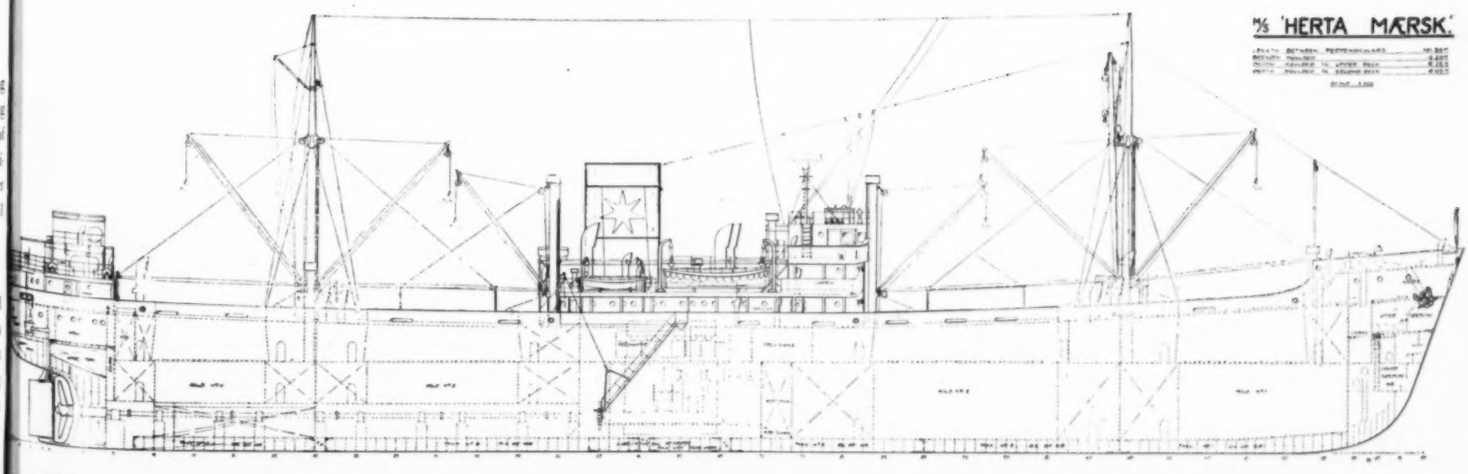
Two Burmeister and Wain auxiliary diesels—3 cylinder, 9.6 x 15.9 inch bore and stroke deliver 150 bhp each at 425 rpm.

Left, Longitudinal midships section of engine room and plan view of same showing machinery layout.

View of maneuvering platform for main engine. It is a Burmeister and Wain direct reversible, single-acting, two-stroke, 5-cylinder crosshead engine delivering 2280 bhp at 112 rpm.



Longitudinal plan view of *Herta Maersk*.



Utica *Observer-Dispatch*

THE "NEWSPRINT" RUN

BACK in April of this year, The New York Central Railroad had a problem and it stemmed from one fact. There was a shortage of newsprint for the big metropolitan dailies and paper was needed—and badly.

Newsprint from Canada was coming down to New York City by way of the St. Lawrence Division, a route that skirted the Adirondack Mountains by running along the St. Lawrence river valley from Malone to Watertown then across to Rome. It was a circuitous route and a time-wasting one. The New York Central adopted a bold expedient. They proposed to send freights over the Adirondack Division, thus cutting time and mileage.

To do this diesel locomotives were called in. A 3 unit EMD diesel developing 4500 hp. was assigned to the Adirondack Division for test purposes. On April 7th a series of tests began which extended over a week's time. The 4500 hp. diesel was hooked up to an 83 car train at Utica for its first round trip to Malone over 169 miles of the toughest rail line in the east. The first trip with the 2600-ton train was a great success with a running time of 5 hours and 45 minutes to Malone and a return trip in 5 hours and 35 minutes. The return trip was non stop, the first "Express" run, ever recorded on the Malone-Utica run by any train.

The following days' tests saw an increase in the tonnage carried by the train in increments of 100 tons daily. Tentative load limits were arrived at following these trials. On the northbound run to Malone, a load limit of 2,850 tons was set and for the southbound run 2,100 tons. The lower limit set on the southbound run is based on the very difficult stretch from Malone to Owl's head —eleven miles of 2.26 per cent grade. This grade, going the other way offers another problem, that of braking the heavy train. The EMD locomotive is a great help in this respect because of its regenerative braking capacity. However it is still necessary to set a certain percentage of retainer valves for individual car braking on this grade. The braking capacity of the locomotive alone is sufficient for the train over the rest of the run in either direction.

The amazing fact resulting from this switch to diesels and the utilization of the Adirondack division route was the saving of approximately 24 hours in shipping time to New York City. It is roughly estimated that seven hours of this time was saved between Malone and Utica, the remainder being saved yardtime, switching, etc., which was formerly necessary using the St. Lawrence division—the long way around.

Another time-saving factor in this diesel operation is that no turn-around time is required. The 3-unit locomotive consists of two "A" units equipped with cab and controls, and a "B" unit, consisting of power unit only. With a cab and controls at each end it is only necessary to move the control levers from one end of the locomotive to the other to operate in the other direction.

This dieselized operation has been in effect now for seven months and the latest reports indicate that it is here to stay. Northbound runs to Malone still operate under a 2900-ton load limit. Southbound trains are held to 2100-tons exclusive of the locomotive and the caboose. This is easily understood when one sees that the ruling grade northbound is 1.67 per cent as against the 2.26 per cent southbound. If the New York Central didn't have to figure on starting a train on these grades the load limits would be considerably higher than this.

Over the past months freights ranging from 64 to 34 cars have made this round trip. Top tonnage has been 2900. Even under top loading the diesels have no trouble flattening out the tortuous twisting curves of the Adirondack division. Big Moose hill, five miles long, with a 282 foot rise reaching the highest part of the run at 2034 feet above sea level is one of these twisting ascents. It is tough railroading country, but not too tough for diesels. They love it.

Without making a direct contrast between the steam and diesel operations over this route it may be said that steam trains handle only 18-20 cars and generally utilize "pushers" over the tough parts of the run. This is a different type of operation from the newsprint run, but one can see what diesels have done by comparison.

There will be no more newsprint shortages if the New York Central has anything to say about it.

DIESEL QUADS TEAM UP ON PUMPS

By JOHN D. SOUTHWELL

WHEN the city of Beaumont, Texas needed standby units to furnish emergency power for water pumping stations, water department engineers faced a unique problem.

Beaumont takes its water from two different stations on the Neches River. Under normal conditions the water is obtained from twenty-mile-distant Bunns Bluff in a gravity flow. But three to six months out of the year this supply is contaminated with salt from the nearby Gulf of Mexico. During this three to six month period, water must be pumped from a station at Weiss Bluff, some 30 miles away.

Because of its relatively low cost in the Beaumont area, electric power is normally used to run the water works. However, because electric power is subject to disruption by storms, standby power was required in order to assure continuout water service and to give the citizens the benefit of low key insurance rates.

Steam generating units had been used in the past as standby power, but they were expensive to operate since a full head of steam had to be kept up at all times. Steam powered units were a handicap, too, in that our limited housing facilities were not sufficient to allow for the amount of steam equipment necessary to take over.

Under the direction of Mr. Hugh Blevins, Superintendent of Beaumont Water Works, and Mr. F. H. Newnan, Superintendent of Production, we studied the situation thoroughly and investigated all types of power. Natural gas, which is the cheapest and most plentiful fuel in the Beaumont area, was not the answer because gas lines are subject to disruption by storms and tides. We needed completely self-contained standby units, the fuel for which could be kept on the premises, so that it would be readily available in an emergency. We needed units that could supply emergency power for all phases of water plant operation including pressuring, filtering and pumping, as well as provide power for emergency operation of police and fire department radio.

The amount of space available for our standby installation was limited. Because of the prohibitive expense of constructing new and larger buildings, we preferred to use for the main plant, the same space which formerly house the old filter plant equipment. This was in one end of the filtration building—which had no special foundation and only 8 ft. 8 in. of headroom. Our diesel generating units had to be sufficiently compact so that they could be maintained successfully in very close quarters. Moreover, we needed a unit that could furnish maximum power with minimum bulk and one that operated with as little vibration as possible. This last factor was important since we had no special foundation on which to bolt the engines.

The engines had to be able to start instantly and take over the full load without delay. Since the engine itself would be located some 300 feet away from the main plant building, a remote control set-up whereby the engine could be started and controlled by a single switch in the main building was necessary.

Stewart & Stevenson offered us completely self-contained 400 kw. remote starting units, that could be installed without the expense of constructing a new building or providing any special foundation. The main installation consisting of two Series 71 Quad powered 400 kw. units, was convenient and even more attractive since a GM twin engine-driven 200 kw. plant at the Weiss Bluff station could utilize the same spare parts.

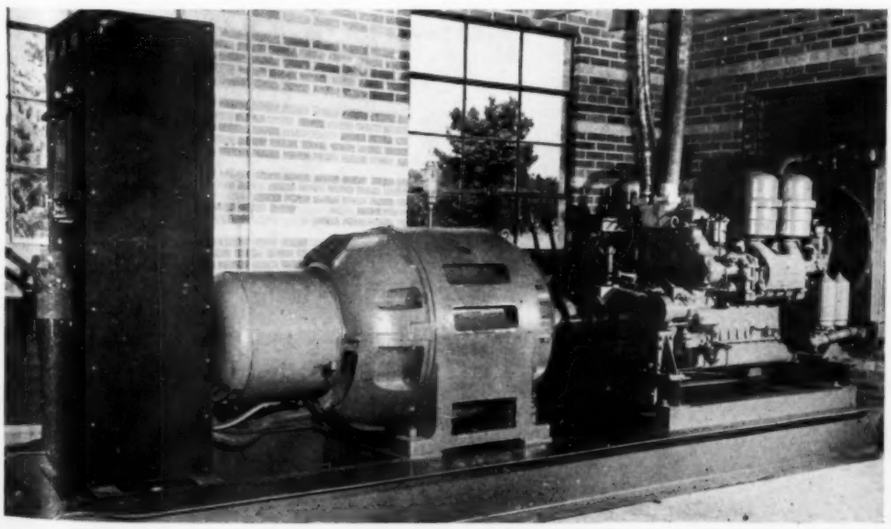
The main plant installation consists of two completely self-contained Stewart & Stevenson 411 kw. generator sets. The generators are General Electric directly connected to General Motors diesel Series 71 Quad engines through Falk flexible couplings. Generator panels are Westinghouse.

The two units have a combined capacity of 800 kw. at 60% power factor. They are capable of operating continuously under full load capacities throughout full 24-hour periods without other attention than proper lubrication and cooling.

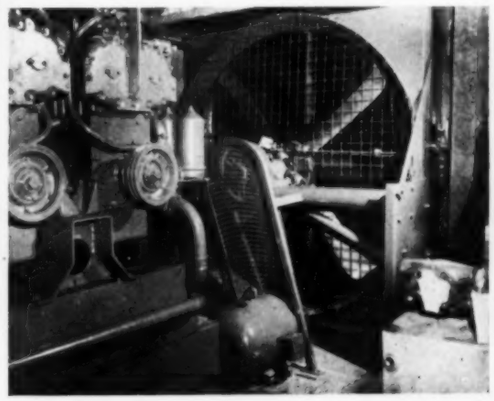
Each completely self-contained generator set is mounted on a rigid sub-base, which maintains engine alignment without the necessity of heavy concrete foundations. The radiator equipment consists of two self-contained skid-mounted radiator assemblies with electric motor driven blower type fans so that the complete radiator can be skidded into the desired position. No other ventilating fans are necessary as the radiator fans take care of both cooling and radiator and forcing the hot air out of the building. Over-all height of the generator sets permit removing pistons and cylinders with maximum ceiling height of 8 ft. 8 in. in the engine room.

Engine auxiliary equipment includes A. C. fuel and lubricating oil filters and Harrison lubricating oil coolers. The exhaust silencers were manufactured by Stewart and Stevenson while the radiator equipment was made for the latter firm by the Young Happy Company. The flexible couplings installed between engine and generators were manufactured by John Waldron Company. Starting batteries are Goodyear. The flexible exhaust tubing is Pennflex.

*Electrical and Mechanical Supt., for the City of Beaumont, Texas.



(left) General Motors twin diesel installation at Weiss Bluff, pumps water 30 miles to Beaumont Texas during rainy season. (Below) Radiator installation for one of the quads at Beaumont pumping plant. It is a product of the Young Happy Company.



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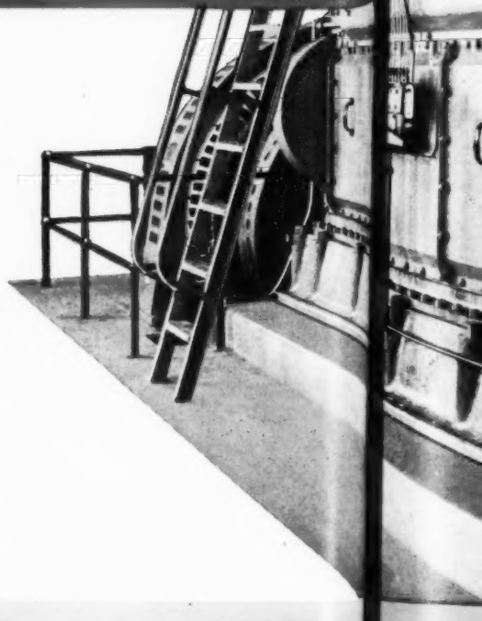

Sinclair RUBILENE OILS have been associated closely with diesels since the early days of this modern power unit. As the diesel has grown and improved, so have RUBILENE OILS progressed with it.

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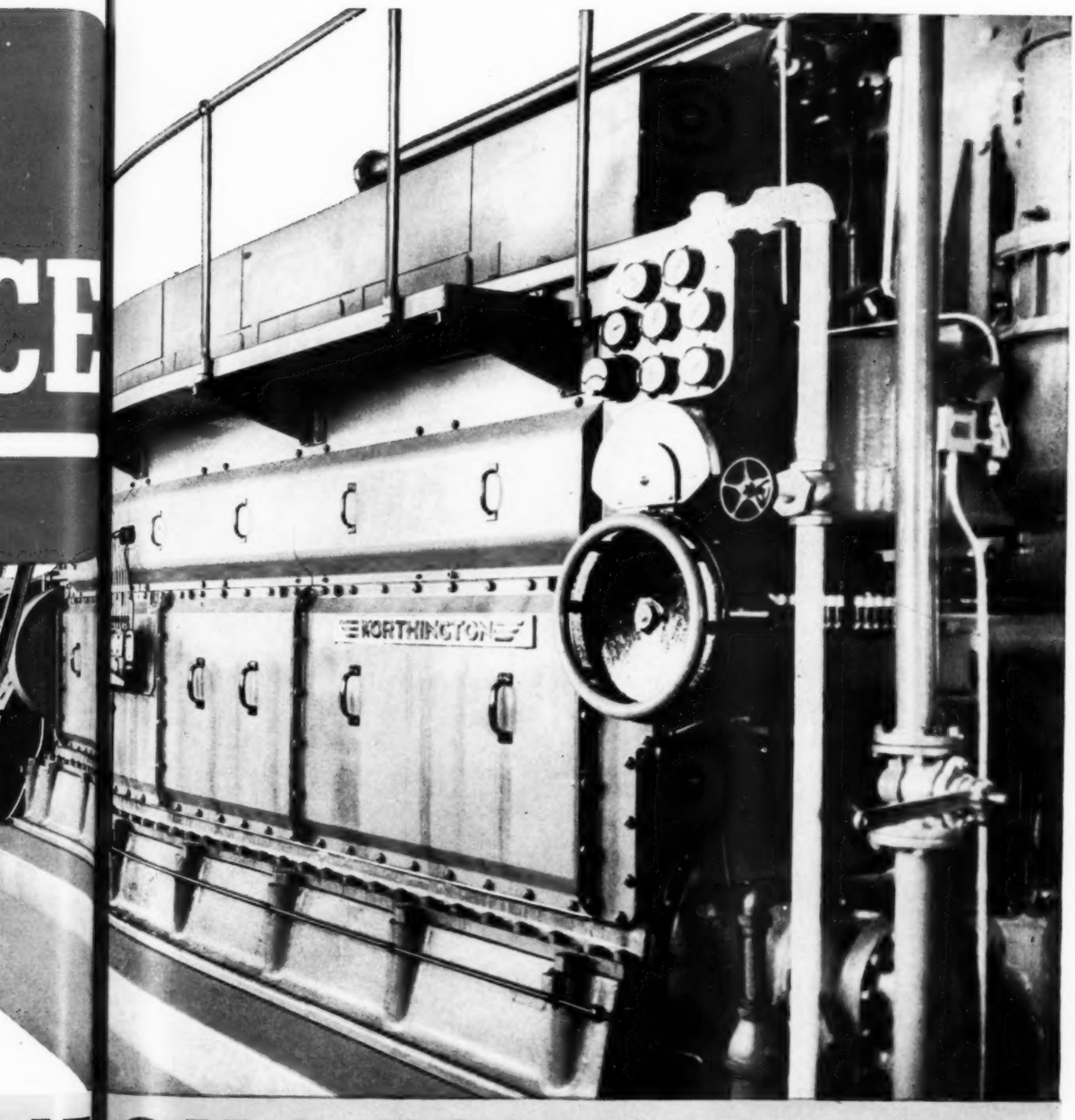

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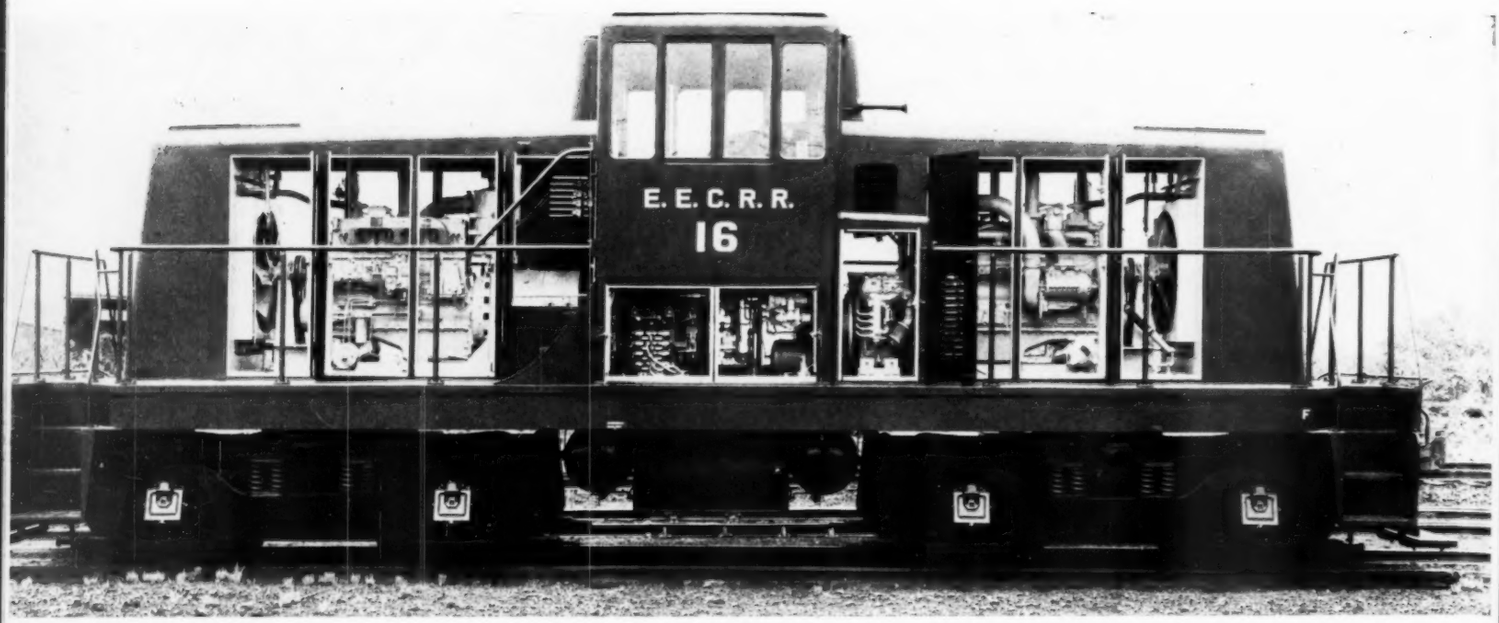


View of General Electric 65-ton locomotive with all doors open showing supercharged Cummins diesels which develop 275 hp. each.

MORE POWER FOR DIESEL SWITCHERS

GENERAL ELECTRIC has recently announced improvements in its standard model 65 and 80-ton switching locomotives. The changes in the diesel-electric units give increased power and improved continuous tractive effort ratings.

The new locomotives are each equipped with two supercharged Cummins diesel engines with a maximum rating of 275 hp. at 2100 rpm., or a total of 550 hp per locomotive. This is an increase of 38 per cent for the 65 tonner and 10 per cent for the larger model. The power actually delivered to the generators for traction is 420 hp. This compares with 330 hp. in the old model 65-ton unit, and 440 hp. on the old 80-ton locomotive of the older model.

This means that, while power available has been increased, the percentage of available power used by the locomotive has been decreased. Because of the increased power, the new locomotives will be able to maintain a higher speed on the heavy pulls, while lower maintenance costs should result from the engines not being worked as hard.

Maximum tractive effort has not been changed because there has been no change in the weight of the units. However, the continuous tractive effort ratings have been improved. The GE motor with which the new locomotives are equipped is a self-ventilating, double reduction motor, that replaces the non-ventilated single reduction motors used in the old models. The improved capacity of the GE-747 means that a certain tractive effort can be maintained for a longer period of time, giving more stamina.

The motor rates 5200 pounds tractive effort on a continuous basis. This is equal to 16 per cent adhesion on the 65-ton and 11.5 per cent on the 80-ton unit. The one-hour rating is 6200 pounds, equivalent to 19 per cent adhesion on the 65-tonner and 13.8 per cent on the 80-tonner. These high ratings enlarge the field of application and makes it possible for them to handle the heavy jobs without blower equipment being added.

Other improvements on the new models are clasp-type brakes and Pullman steps on the 65-tonner (standard on the 85-ton engine; hinged windows in front of the operating station; and a full metallic circuit with ground relay to provide a degree of protection from damage due to accidental grounding.

Operator's cab of 65-ton locomotive showing control panel.

Figure 1. shows speed-tractive effort curve for 65-ton General Electric locomotive.
Figure 2. shows same data for 85-ton locomotive. Note high tractive effort at slow speeds.

Fig. 1

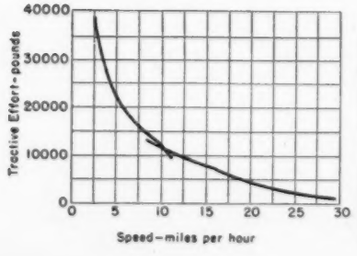
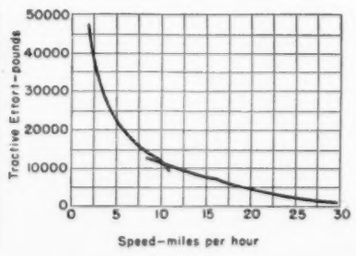
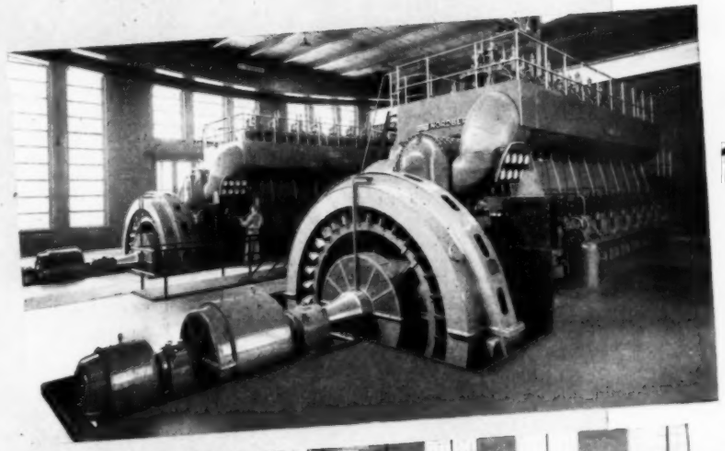


Fig. 2



NORDBERG DIESELS . . .



Dependable solution to 3 basic power problems

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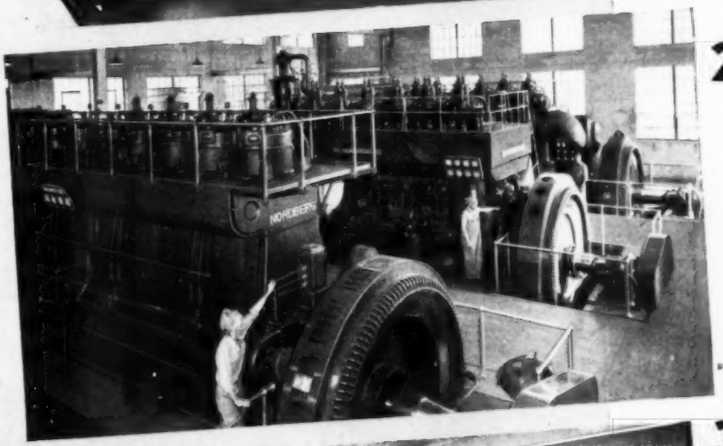
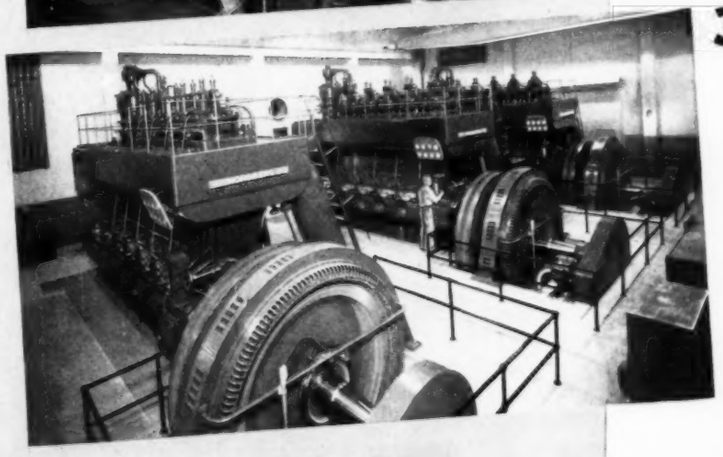
. . . . such as this Iowa Electric Light & Power Co. installation at Marshalltown, Iowa. In addition to the two 3600 B.H.P. Nordberg Diesel Engines shown, there is a third Nordberg engine of 7100 B.H.P. installed in this same plant.



2 For MUNICIPAL PLANTS

. . . such as this typical installation for the City of Greenville, Texas, showing three of the five big Nordberg Diesel Engines generating dependable, low-cost power for this municipality. From an initial installation of two units of 2450 horsepower made in 1933, the plant now has a total of 9650 horsepower in Nordberg Diesels.



3 For INDUSTRIAL PLANTS

. . . such as this modern, air-conditioned installation at the Universal Atlas Cement Co. plant, Atco, Texas. The three 2000 horsepower gas burning Nordberg Diesels in this plant are proving that they produce power at lower cost than is possible with any other type of power unit.

NORDBERG Stationary Diesel Engines are built in two and four-cycle types, in a wide range of sizes from 175 to 8500 horsepower. Backed by 59 years of engine building experience, Nordberg Diesels today represent DIESEL POWER AT ITS BEST. Write for complete details.

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Gordon LeFebvre, president of D.E.M.A.

D. E. M. A. DIESEL PANEL HIGHLIGHTS MARINE CONFERENCE

ON OCTOBER 14, 1948 the Diesel Engine Manufacturers Association presented a very interesting and informative panel discussion on "Users' Experiences with Diesel Engines" at the American Merchant Marine Conference held in New York under the auspices of the Propeller Club of the United States.

The panel under the able chairmanship of Gordon Lefebvre, president of the D.E.M.A. and also president of the Cooper-Bessemer Corporation, and Co-Chairman Otto H. Fischer, president of the Union Diesel Engine Company, and vice chairman of the Association, was one of the finest yet presented. It represented a challenge to the marine industry to investigate the tremendous possibilities offered by diesel propulsion. All the speakers, men influential in America's marine industry, spoke enthusiastically of diesel operations within their own particular fields of marine activity all over the world.

The inland waterway picture was ably discussed by Harry B. Jordan, president of the Canal Barge Company and A. J. Dawson, chief engineer of the Dravo Corporation's marine department. Ocean-going vessels were the subject of talks by Charles L. Boyle, marine manager for the Sun Oil Company, who discussed "Diesels in Ocean Going Tankers"; Edmond J. Moran, president of the Moran Towing Co., who described diesel use in ocean towing; Stanley M. LeCourt, research engineer for the Mississippi Shipping Company, who gave the picture as regards diesel engines in cargo ships, and Captain Wilhelm Eitrem, of the Fred Olsen Line Agency, who told the company's diesel operating experiences.

Diesel in the naval armed services were ably discussed by Captain George F. Hicks, U.S.C.G., and Commodore Lisle F. Small, U.S.N., Ret., executive engineer of the Lima-Hamilton Corp.

Opening the panel discussion, Albert J. Dawson discussed the development of diesel engines as applied to river towing. He described this development as radically changing the concept of river transportation—the increase in power and cruising range of river boats, and lower operating costs for diesel engines. The change is reflected, he said, in the statistics of the industry which reveal that 76½% of all river towboats are diesel as of 1948. Adoption of orderly programs of maintenance have enabled operators to impose a minimum of 85% operating efficiency on their diesels. Diesel towboats now operate as much as 7,700 hours a year.

Dawson laid stress on proper engine controls for diesel towboat installations. He said that controls both speed and directional, must be accomplished by a single lever for each engine. Furthermore controls should cycle automatically without timing on the part of the operator. Pilot house controls have become a must for river towboats.

Harry B. Jordan, speaking of diesel operation in the New Orleans area, paid tribute to George Codrington of General Motors for his part in the development of diesel towboating. The *Bull Calf*, Canal Barge Company's first diesel towboat represented the first relatively high speed diesel installation. It was a General Motors job. This installation was later used as a model for wartime amphibious craft.

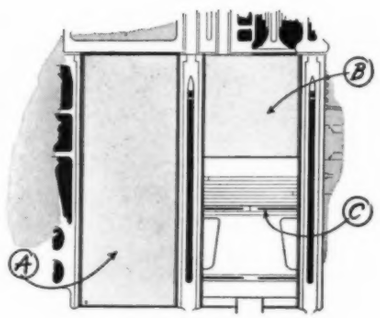
As for ocean going diesels, Charles L. Boyle of Sun Oil Company cited the experience of his company with diesel tankers, which operate exclusively on bunker "C" oil. He advised diesel operators to train diesel engineers, have adequate spare part inventories, adopt progressive maintenance procedures. Engine builders, he advised should reduce weights of engine parts where possible and build injection systems suitable for the use of heavy oils such as bunker "C." The use of these heavy oils would enable U. S. shippers to meet competition from foreign bottoms, he said. Edmund J. Moran of Moran Towing Company described the use of diesel tugs in ocean towing. He cited the remarkable records rolled up by relatively small tugs during the war. Furthermore he said that the use of diesel tugs with their long cruising radius had practically put the big steam tugs out of business in ocean towing.

Stanley M. LeCourt of the Mississippi Shipping Company, gave some of the reasons why American ship operators were reluctant to accept the diesel engine. These included high fuel cost, high wages to diesel engineers, and higher maintenance cost. He then proceeded to cite chapter and verse the actual experience of his company with diesel ships compared to steam vessels. The company operates five C1A's equipped with diesels and one steam C1A. After 14 months operation a study was made of comparative cost of operation. As far as fuel was concerned, with diesel fuel at $3.40 per barrel and Bunker "C" at $2.51 per barrel, the average cost of fuel per mile at sea was $1.318 for the turbine ship and only $1.154 for the diesel vessels. In port, the steamer's fuel bill was $2.885 per hour as against $1.241 for the diesels. Lubricating oil expense for the diesel is higher than for the turbine ships. As for the higher wages paid diesel operators, the company has found that the total monthly payroll for the steamship is $272.01 more than that of the diesel ships. As for maintenance and repair cost the diesels averaged $40.00 per day as against $48.00 for the turbine vessel. Summarizing the operating cost shows an annual saving of $25,605.72 in favor of diesel operation.

Captain Wilhelm Eitrem of the Fred Olsen Line backed up LeCourt's figures by some of his own taken from the line's records.

Lisle Small paid tribute to the diesel for its remarkable record during the war, especially in the submarine and amphibious phases. He paid further tribute to the builders of these engines, saying "I surmise that the Great Architect of the Universe has a very kindly feeling for diesels. This must be true because in this country He and His wisdom appointed some of the finest and most genuine people on the face of the globe to build them." Captain Hicks gave an excellent resume of diesel crafts in the Coast Guard stating that that branch now had in excess of 875,000 diesel hp. in service.

CASE D119E—REDUCING WEAR ON LINERS IN DIESEL ENGINES



DIESEL ENGINE LINERS AND PISTON

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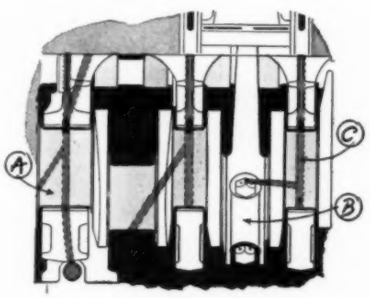
C. Contains detergent which keeps rings clean and operating freely...prevents scratching and gouging of liners.

RPM DELO Diesel Oil will not corrode any bearing.

CASE D119F—PROLONGING THE LIVES OF BEARINGS IN DIESELS



SECTION OF DIESEL ENGINE CRANK AND CAM

No bearing failures occurred between overhaul periods in Diesel engines used in the toughest service when they were lubricated with RPM DELO Diesel Engine Lubricating Oil.

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Exchange Your Diesel Maintenance Ideas

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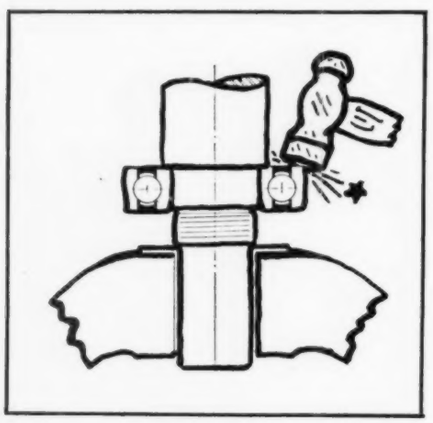
Anti-Friction Bearing Maintenance

THE removal of bearings or races by driving with a hammer is the most common method used and also, the least desirable. The only time when this method should be justifiable, is when no other means is available. Driving can easily become the cause of injury to the bearing and to the serviceman. There are, however, a great many occasions in field service where no other method can be applied. Under such a condition, close observance to the following rules can prevent injury to the operator and to the bearing.

1. When and where possible, mount the shaft or housing in a vise using wood blocks, leather or soft metal guards to protect the shaft or housing from injury by the vise jaws.

2. Do not use soft metals or wood to drive the bearings or races because chips and splinters may cause injury to the operator or find their way into the bearing.

3. Do not drive directly on races, cages or roller assembly.



WRONG

4. The driving force must always be directed against the face of the press fitted race to avoid damage to separators, rollers or bearings operating surfaces.

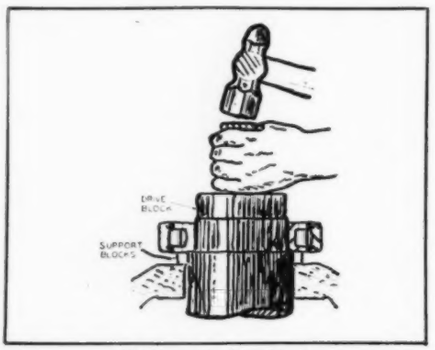
5. Avoid using a blunted cold chisel as harm to the bearing or to the operator may result.

6. In driving, use smart, quick taps, rather than heavy blows. This will prevent the race from cocking and harming the shaft.

7. Tap alternately on opposite sides of the race to make sure that the race will move uniformly off the shaft.

8. Work in clean surroundings with clean tools and with clean hands.

Heating bearings to remove is not generally recommended because of the danger of overheating, temper drawing, and the development of soft



Driving with drive block.

spots leading to failure when the bearing is later operated. Where the race to be removed has already failed or is not intended for further use, precautions must still be taken to protect the shaft from overheating.

The best means of applying heat is by pouring hot oil over the race. It may be necessary, however to use a direct flame from a blow torch. In no case can the race be heated beyond 300 degrees Fahrenheit without danger of softening. Wet cloths wrapped around the shaft may prove effective in carrying away excessive heat.

When no other method of race removal can be used, as where no provision is made for gripping the race, the race must be completely destroyed. This must be done in such a manner that the shaft is not injured, and usually involved grinding or burning the race partially through with a grinder or acetelyne flame. This may reduce the pressure between race and shaft and permit easy removal, or it may be necessary to crack through the rest of the way with hammer and cold chisel. The chisel should not be directed straight down toward the shaft, but rather tangentially against the side of the groove which has been cut in the race. With small races mounted on such shafts, a sharp blow may be enough to crack the race. It must be emphasized that in all operations of this kind there is considerable danger of injury both to the operator and to the shaft itself.

Sections of pipes or tubes are the simplest accessories that can be used to aid in driving a race or bearing off a shaft or out of a housing. The size of the pipe or tube should be such that only the race through which the driving force is being directed is contacted. The inside diameter of the tube should be only slightly larger than the shaft so that the shaft can act as a guide and prevent the tube from injuring the snap rings or separator. A steel block is used as a cap to distribute the force of the hammer blows.

In case the shaft is too long to use a pipe and steel block conveniently, lugs can be welded on two opposite points of the outside diameter. The driving is done against these lugs, and should be done on opposite sides alternately, in order to move the race off uniformly. Where obstructions prevent the tube from being slipped over the shaft, this tube can be split and the two halves assembled around the shaft where they can be held together by means of wire or steel bands.

Drive blocks are preferable to pipes or tubing but unfortunately their use is limited to certain applications or conditions. They cannot be used with very large bearing or where the back face of the inner race is obstructed. They have been found to be a neat, positive means of bearing removal in which the danger of damage to the bearing is relatively small.

Installed bearings can be cleaned with a light oil heated at 180° F. to 200° F., flushed through the housing while slowly rotating the bearing. Where the grease or oil is badly oxidized and cannot be removed by this method, a petroleum solvent such as kerosene or safety naphtha may prove effective. In extreme cases, a mixture of alcohol and kerosene or safety-naphtha will remove the greater part of the sludge and scale. When petroleum solvents, by themselves or with alcohol added, are used in this manner, they should be followed by a flushing with light oil before the lubricant is added to the housing. This will wash any of these solvents away.

Taken from the Allis-Chalmers Reporter, September-October Issue

Disney Named Vice President By Whitcomb Locomotive Company

THE Whitcomb Locomotive Company, a wholly owned subsidiary of The Baldwin Locomotive Works, today announced the election of Mr. Roland C. Disney as Vice-President and General Manager of the Company. Mr. Disney has been associated with The Baldwin Locomotive Works as Assistant to the Vice-President of the Eddystone Division of that Company.

Ex-Cell-O Announces Promotions

PHIL HUBER, President and General Manager of Ex-Cell-O Corporation, Detroit, announces several promotions in the executive personnel of the company, following a recent meeting of the Ex-Cell-O Board of Directors. One change that will be of widespread interest to those in the manufacturing field is regarding James K. Fulks, Vice President in Charge of Manufacturing at Ex-Cello-O since early in 1942. He now becomes a director of the company as well as an active officer. The selection of Mr. Fulks, a graduate engineer, is regarded as a well deserved personal recognition of his successful work with the company since 1925.

J. K. Fulks

J. F. Miller D. H. McIver

Two other changes were announced by President Huber. John F. Miller becomes Sales Manager of the Machine Tool and the Cutting Tool Divisions, and D. H. McIver the Sales Manager of the Aircraft and Miscellaneous Parts Divisions. Both Mr. Miller and Mr. McIver became associated with Ex-Cell-O in 1929, and having been active in sales work for a number of years, are well known throughout the large production industries of the country.

Caterpillar Appointments

GERALD W. WILSON and William F. Jordan have been appointed District Representatives in the Eastern Sales Division of Caterpillar Tractor Co., Peoria, Illinois according to recent announcement made by W. S. Zeigler, Eastern Sales Manager.

G. W. Wilson W. F. Jordan

Wilson will represent the Company in contacts with distributors in northern Georgia, South Carolina and eastern Tennessee while Jordan will contact dealers in northern Ohio, Michigan and West Virginia. He replaces F. S. Foster, who was named Assistant Eastern Sales Manager recently.

Jordan, a native of Indiana, gained invaluable experience in the employ of construction companies prior to his entry into the U. S. Navy.

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Cooper-Bessemer Announces Opening of Chicago Office

EXPANSION of the Cooper-Bessemer Corporation's nationwide sales facilities, through the addition of a Chicago branch office, was announced recently by Stanley E. Johnson, Vice President and Director of Sales.

The new office, located at 122 South Michigan Avenue, in the People's Gas Building, will be under the direction of Robert S. Bowie, who has been associated with Cooper-Bessemer since 1936 in other sales capacities.

R. S. Bowie

C. L. White

Mr. Bowie, who is well known in the diesel, gas engine and compressor fields, joined Cooper-Bessemer as a member of its headquarters sales staff in Mount Vernon, Ohio and subsequently has been associated with the company's Dallas sales office. He has been active in the Chicago area since 1946.

Mr. Bowie's activities will continue under the supervision of Charles L. White, district manager for Cooper-Bessemer in the North Central area. Mr. White's headquarters are in the company's Mount Vernon offices.

Watt Elected Vice President By Baldwin

R. NEVIN WATT has been elected Vice-President in Charge of Sales of The Baldwin Locomotive Works. Mr. Watt was born in Philadelphia and entered the employ of Standard Steel Works Co., now Standard Steel Works Div. of Baldwin, in 1913. After filling various positions in the company, he was appointed Sales Manager of Standard in 1930. In 1942, Mr. Watt was made General Sales Manager of The Baldwin Locomotive Works, and in May, 1948 he was appointed Assistant Vice-President—Domestic Sales, which position he held at the time of his recent promotion.

R. N. Watt

Swift Named By Caterpillar

GUY I. SWIFT has been appointed Assistant Steel Fabrication and Assembly Factory Manager at Caterpillar Tractor Co., according to a recent announcement made by James R. Munro, General Factory Manager.

Coincident with the announcement, Mr. Munroe elevated Hubert Boggs, a Caterpillar employee since 1936, to Swift's position as superintendent and Maurice Foote to Boggs' position as general foreman of erection.

G. I. Swift

Swift formerly was associated with the Russell Grader Manufacturing Company of Minneapolis and when Caterpillar acquired the Russell Company he came to Peoria as foreman of the machine shop. In 1940 he advanced to general foreman and continued in that capacity until 1942 when he moved to the superintendent's position.

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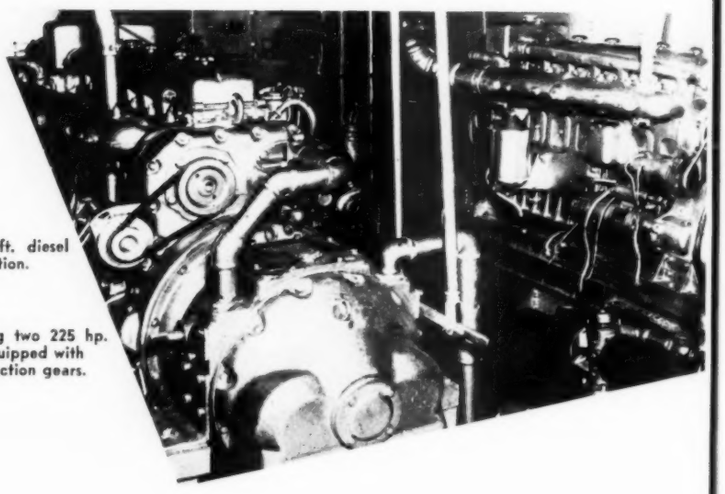
All Steel Diesel Tug

Mooremack T-3, new 50-ft. diesel tug of steel construction.



Engine room view showing two 225 hp. General Motors diesels equipped with 4:1 Snow Nabstedt reduction gears.

DOWN the ways of Mill Basin Ship Repair of Brooklyn, early in the month of August, went a 50-ft. all steel twin diesel tug.

Completely steel welded throughout and propelled by two General Motors 6-71 diesels sold and installed by Benjamin's for Motors, the vessel has a beam of 16 ft. and a 6 ft. draft when fully loaded. The two engines turn 48 in. Columbian bronze wheels through 4:1 Snow-Nabstedt reduction gear and clutch. Located in a roomy engine room, they are mounted so that all parts are easily accessible and so that the engine crankcases can be dropped for crank shaft inspection. In the engine room is also located the fuel and raw water strainers, lube oil and fuel oil tanks with a capacity of 2,000 gallons giving the boat a cruising range of approximately 1,000 miles.

Destined for use in Belem, Brazil on the Amazon River, all possible care was taken to make the boat as liveable as possible under the blistering equatorial sun encountered there.

The deckhead and shell and the crew's quarters forward, as well as the pilot house are well insulated with 3 in. Johns-Manville insulation. The engine fidley is provided with very large light weight steel hatches. When in use in the tropics these hatches can be removed for additional engine room ventilation.

In the pilot house, controls are so grouped so as to enable one man to effectively pilot the vessel. The controls are Columbian Bronze Units.

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Tuthill Model C general purpose pumps are low in first cost, low in upkeep and provide dependable service on non-corrosive liquids. These compact internal gear rotary pumps operate in either direction of rotation. Capacities up to 200 g.p.m. and pressures to 100 p.s.i. Direct drive, slow-speed V-belt units and stripped models. Write for Tuthill Model C bulletin.

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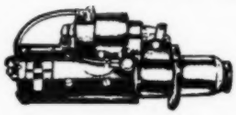

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5227231	No. 80 Injector and Case
5157393	Blower Assembly—Left
5157396	Blower Assembly—Right

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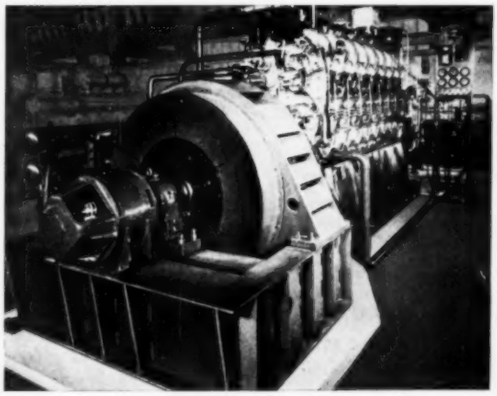

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McGinnis Named by Elliott Company

C. F. McGINNIS has been appointed assistant sales manager of the Ridgway Division of Elliott Company, Jeannette, Pa., according to F. W. Dohring, vice president in charge of sales. Mr. McGinnis has been with Elliott since 1936. He has been in the electric power department at Ridgway and also was manager of the Kansas City office before returning to Ridgway last year.

Baldwin Appoints Chicago Manager

THE Baldwin Locomotive Works recently announced the appointment of Curtis G. Green as Manager of the Chicago District Office, replacing D. I. Packard who has resigned.

C. G. Green

Mr. Green was born in St. James Parrish, La., and has been connected with Baldwin since 1920 in various sales and engineering capacities which took him into all parts of the United States. In 1917-18 he served in the United States Navy.

Mr. Green has been closely associated with all phases of Baldwin's diesel-electric locomotive activities, and for the past two years he has been Manager of Mexican Sales, spending a great part of his time in that country.

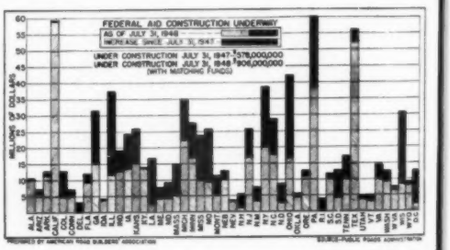
Fessler Heads Penn Dayton Office

F. X. FESSLER has been named manager of the Dayton district office for Penn Electric Switch Co., according to an announcement by R. H. Luscombe, general sales manager. He succeeds E. A. Price, who was made manager of the company's New York district office.

Roadbuilders Association Reports Biggest Year for Federal Aid Highway Construction

FEDERAL aid highway construction continues to increase as the highway industry and profession goes forward with its program of peacetime reorganization and adjustment. The dollar volume of federal aid highway work under construction July 31, 1948, amounting to $906,000,000, far exceeds that of any previous figure in the history of the federal aid program.

As of July 31, 1946, total federal aid highway work under construction, including matching funds, amounted to $385,000,000, according to figures submitted by Public Roads Administration. One year later, July 31, 1947, this figure had increased to $578,000,000, and a year later, July 31, 1948, the total under construction was $906,000,000.



As of the latter date, plans had been approved, but work not started amounting to $435,000,000, and projects programmed only, amounted to $680,000,000, both figures including matching funds. Federal aid balances unprogrammed amounted to $186,000,000.

New federal aid funds are provided by the Act passed in June of this year. The Act authorizes funds amounting to $450,000,000 a year for each of the fiscal years ending in June, 1950 and June, 1951. Forty-five per cent of the total is allocated to the federal aid system, 30 per cent to the secondary system, and 25 per cent to the federal aid urban system. Matching is on a 50-50 basis.

The fact that many states show huge increases in the amount of work now actually under construction (see chart) is proof that many of the problems confronting the industry resulting from the war are being worked out. With ample funds provided for the near future, the federal aid highway program should continue to increase. The need for it was never greater.

Annual Meeting of the Society of Naval Architects and Marine Engineers

THE 56th Annual meeting of The Society of Naval Architects and Marine Engineers will be held in New York City on November 10th to 13th, 1948, at The Waldorf-Astoria. The Annual Meeting of the Council of the Society is scheduled for the afternoon of Wednesday, November 10th.

Morning and afternoon technical sessions of the members, drawn from the shipping and shipbuilding industries of the nation, are planned for Thursday, November 11th and Friday, November 12th at which Vice Admiral E. L. Cochrane, President of the Society, will preside. Papers on technical subjects related to the industries, prepared by outstanding experts in their field, will be presented and discussed by members.

A feature of the meeting will be the Annual Banquet of members of the Society on Friday evening, November 12th in the Grand Ballroom of the hotel. Leading government officials and industrialists will be in attendance and a prominent speaker will address the assemblage on a subject of current and timely interest. The annual presentation of awards by the President of the Society will be made during the Banquet.

The meeting will close on Saturday, November 13th with a Dinner-Dance for members, wives and guests, for which a program of outstanding entertainment and dance music has been arranged.

Diesels Increase Passenger Revenue

ERIE RAILROAD is expected to be using the Cleveland Union Terminal by next March or April. This means that before the summer of 1949 all railroads entering Cleveland, except the Pennsylvania, will be using the Union Terminal for passenger service.

Erie President Robert E. Woodruff announces that all the company's trains in and out of the terminal will be diesel-powered and will require no change of engines on approach to the station. He explained that while the Erie generally was regarded as a freight road, its passenger revenues in the past five or six months had increased $500,000 with the use of diesel locomotives and modern coaches. Changing the route from the old station to the terminal will involve construction of 4,628 feet of new track and road bed.

New Board Members at Baldwin Locomotive

MR. CHARLES E. BRINLEY, Chairman, announced recently that at the regular meeting of the Board of Directors, the following persons were elected as members of the Board of Directors of The Baldwin Locomotive Works: Messrs. A. W. Robertson, Gwilym A. Price and L. B. Osborne, Chairman of the Board, President and Senior Operating Vice President, respectively, of Westinghouse Electric Corporation.

The election of the following personnel as officers of the Company was also announced: Messrs. James R. Weaver, Vice President in Charge of Manufacturing — Eddystone Division; John S. Newton, Vice President in Charge of Engineering—Eddystone Division and R. Nevin Watt, Vice President in Charge of Sales—Eddystone Division.

Eaton Names Winther Vice President

J. O. EATON, Chairman of the Board of Eaton Manufacturing Company, announced recently that M. P. Winther was appointed Vice President and Director of Engineering of the Company. Mr. Winther has been associated with the Company since March, 1946, when Eaton acquired Dynamatic Corporation, Kenosha, Wisconsin, of which Mr. Winther was President and General Manager. Mr. Winther has also been a Director of Eaton Manufacturing Company since March, 1947.

Great Northern Adds to Diesel Fleet

ACQUISITION by Great Northern Railway of new diesel-electric locomotives and freight cars costing $13,510,000 was authorized recently by the executive committee of the board of directors. The locomotives include two American Locomotive diesels of 6,000 hp. for freight service, ten American Locomotive 1,500 hp. diesels for road and switching duty and twelve 1,000 hp. switchers to be supplied by Electro-Motive.

Engineering Societies Meetings Scheduled

S.A.E. National Meetings

Fuels and Lubricants	The Mayo 1949	Tulsa, Okla.	Nov. 4-5
Annual Meeting and Engineering Display	Book-Cadillac Hotel	Detroit, Mich.	Jan. 10-14
Passenger Car, Body and Production Meeting	Book-Cadillac Hotel	Detroit, Mich.	March 8-10
Transportation Meeting	Statler Hotel	Cleveland, O.	March 28-30
Aeronautic and Air Transport Meeting	Hotel New Yorker	New York, N. Y.	April 11-13
Summer Meeting	French Lick Springs Hotel	French Lick, Ind.	June 5-10
West Coast Meeting	Mulmomah Hotel	Portland, Ore.	August 17-19
Tractor (possibly diesel)		Milwaukee, Wisc.	September.

A.S.M.E. National Meetings

Annual Meeting	Hotel Pennsylvania 1949	New York, N. Y.	Nov. 28-Dec. 3
Spring Meeting		New London, Conn.	May 2-4
Semi-Annual		San Francisco, Cal.	June 27-30
Fall Meeting		Erie, Pa.	Sept. 28-30
Annual Meeting	Hotel Pennsylvania	New York, N. Y.	Nov. 27-Dec. 2

G.E. Roughness Scales

A NEW pocket-size surface roughness comparator for sight and feel comparison with machined finishes has been announced recently by the General Electric Special Products Division.

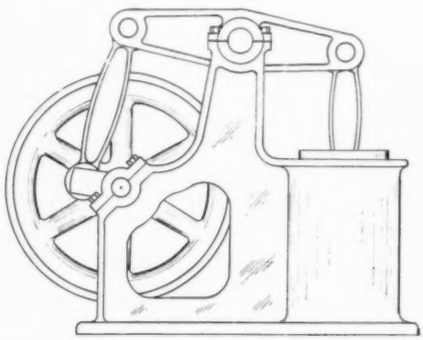
Known as the Surface Roughness Scale, the new comparator is composed of two small metal rules 6 inches long and 1¼ in. wide. These illustrate degrees of roughness ranging from the smoothness of a bearing surface to the roughness of a flame cut.

One side of each scale is divided into 12 surfaces, depicting a total of 24 different surfaces. are grouped into 10 degrees of surface roughness. Every degree is identified by a number which designates the nominal roughness in micro-inches.

"Bouncing Bessie"

Editor's Note: In a recent letter to John Anderson, Mr. John Homewood of Ontario, California, described his father's experience with an old Brayton oil engine at the turn of the century. We print excerpts of the letter here for they show, in a humorous way, the trials of the early diesel men.

"MY FATHER, who has long since gone to his reward—where petroleum engines are rated at 100% efficiency—picked up this engine, which by the way tipped the beam at about two tons and developed about ten horsepower, at some junk yard in Philadelphia. He worked on it faithfully for about three months and finally got it in running order. . . . I particularly recall the circular



Old Brayton engine reconstructed from fond recollection.

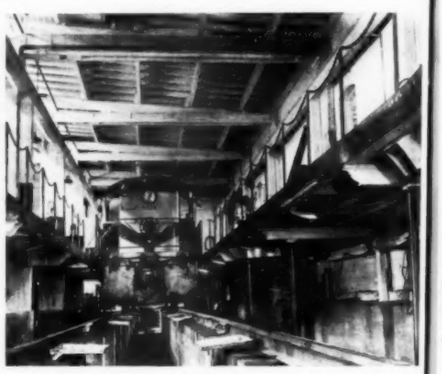
burner, about four inches in diameter he had made up on company time. This 'government' job housed an asbestos wick. The purpose of the burner as I understand it, was to warm up the cylinder. I am not quite certain if the burner's function was to ignite the charge of oil and air vapor or not. Father would open a gate, at the base of the cylinder, and insert a long taper through the small aperture in order to light the burner. Then after the cylinder heated up sufficiently, a flame would roar out through the little hole and fill the house with horrid smelling smoke. Finally the flame would come out such as one sees on a blow torch.

"This was the signal for action! There was a small 25 gallon air storage tank beside the engine which we boys had to pump up to a pressure of about sixty pounds while the cylinder was being warmed up. At the signal from the chief engineer, my two older brothers and I would take up our various assigned stations and help out in getting Bouncing Bessie—as mother used to call it—on her pounding way. Upon the downward stroke of the eight-inch piston, the explosion would be released through the little opening. To the engineer's mind this was the moment for self propelling and he thereupon shut the gate and, with the aid of the compressed air and two husky kids at the wheel the old Brayton got under way of its own accord. It had reached its oscillating independence!

"Outside of the fact that the police threatened my father with confinement if he didn't stop the annoyance to the worried neighbors, and that my poor mother was driven almost to distraction by the pungent-smelling smoke and ungodly noise coming up from the cellar, the famous rocking horse ran to perfection—eventually. 'Bessie' was sold to a discriminating buyer for fifteen dollars more than the purchase price of $35.00. It was then lugged in a piano-moving truck to the new owner's shop and set up on a new concrete foundation. Whether it was the change of elevation—about ten feet difference—or whether it resented being taken away from its loving owner, strange to say it did not start up again."

D & M Railroad Shops

WHEN the Detroit & Mackinac Railway switched from steam to diesel locomotives the company revamped its repair shops at Tawas City, Mich., to accommodate the new equipment. An 11-track roundhouse that had been used for steam locomotives was abandoned and the railroad's machine shop was converted for the maintenance of diesels.



Repair Pit in D & M's shop—note hot air ducts.

During the remodeling program, D. & M. also modernized the heating system in its shops by replacing a boiler plant and overhead steam radiators with four oil-fired, warm air space heaters. Besides keeping the shops at a comfortable working temperature during the winter, the new heating system also is used to melt snow and ice from the trucks of locomotives taken in for maintenance and repairs.

In converting the machine shop, two service pits were dug, tracks installed and working platforms built in one section of the building. These facilities are considered adequate for the maintenance necessary on the line's seven diesels which had replaced 19 steam locomotives.

The new heaters are a development of Dravo Corporation, and, in addition to their use for space heating, also can be employed for summer ventilation. The models used at the D. & M. Shops have an output capacity of 750,000 Btu. per hour each.

Crocker-Wheeler Announces New Motor

THE Crocker-Wheeler Electric Manufacturing Company, announces the addition of the AISE Standard 600 Series mill motor to its line of dc steel mill motors.

The new Crocker-Wheeler mill motor is adaptable for use totally-enclosed non-ventilated or sepa-

rately ventilated. It can also be furnished suitable for self ventilation. The self ventilated machines are cooled by a fan mounted at the rear of the armature; in the totally-enclosed non-ventilated motors, the fan action is provided by the back ends of the coil supports. Effective internal circulation of air lowers hot spot temperature.

Special grease slingers and grooves keep grease and dust away from commutator and windings. The bearing caps are readily removable to facilitate bearing inspections. The improved solid cylindrical roller bearings are completely supported against thrust and radial loads. Shaft stress is low because the bearings are close to the load. Improved commutation is provided by split brushes and four interpoles. Ready access to the commutator bolts is provided in all motors.

Up She Goes

Lorain log loader equipped with G.M. diesel.

BEDAL AND SMITH are logging contractors of Crouch, Idaho. Pride of their equipment is a Lorain log loader, vintage 1941, that is powered by an 86 hp., 3-cylinder General Motors diesel engine. Built for rough going, the machine is equipped with a Brown-Lipe transmission and Timken heavy duty rear end. The boom measures 28 ft. and has a 250 ft. cable which the operator can throw out during skidding operations with amazing accuracy. Purchased by its present owners as a used unit in 1944, the loader is assigned to work just behind the falling crew. Following the logging route it skids 12 to 18 ft. logs from the woods and decks them beside the road for the truck loaders to pick up. During an average 10 hour day, the GM diesel powered Lorain will handle a little better than 100,000 ft. of logs, although its record for any single day is 150,000 ft.

3-Year Engineering Production Program Under Way at Brown

A THREE-YEAR program for expansion of development and production operations has been started by Brown division of Minneapolis-Honeywell Regulator Company as the second step in its $2,500,00 physical expansion. The first part of the three-year program has resulted in the hiring of 40 newly graduated engineers.

"The three-year schedule," said Henry F. Dever, president of Brown Instrument Company, Philadelphia, "not only means a necessary increase in our engineering staff but in several ways contributes toward providing newly hired graduates with a clearer and earlier insight into our manufacturing methods and procedures. It speeds up their becoming well acquainted with new and modern industrial processing.

The plan, Dever pointed out, includes speedy indoctrination of the new engineers who are being assigned to various engineering departments. It means an immediate expansion of the company's development engineering by 30 per cent and by 10 per cent in application, industrial and general engineering.

Avondale Complete 65′ Workboats For Creole Petroleum Corporation

65-foot workboat for oil company

THE two 65′ workboats which have been under construction for Creole Petroleum Corporation at the River Plant of Avondale Marine Ways, Inc., New Orleans, have been finished and final trials completed. The tests proved to be highly satisfactory in all respects. They now await transportation to Venezuela. These boats are powered by a single 165 HP General Motors Series 6-71 diesel engine, driving a single propeller. These boats were clocked over the measured mile at a speed of 10.5 miles per hour. They are to be used in the marine oil field in eastern Venezuela. This is a new type of boat, and eyes of the petroleum industry are focused on its performance. It is thought that it will prove most successful, and that many other oil companies will seek it for use in the marine field off the coast of Louisiana.

What's This?

No, that isn't a whole factory on the move. But it's a hefty piece of one—a 107-ton piece, in fact. From rail siding to new steel mill site in Birmingham, Alabama, seven such pieces of machinery, stands for lathe mill housing, were recently moved by Eagle Motor Lines. To accomplish this believe-it-or-not job Eagle used a Fontaine Truck Equipment Company low-bed trailer and a Mack diesel tractor.

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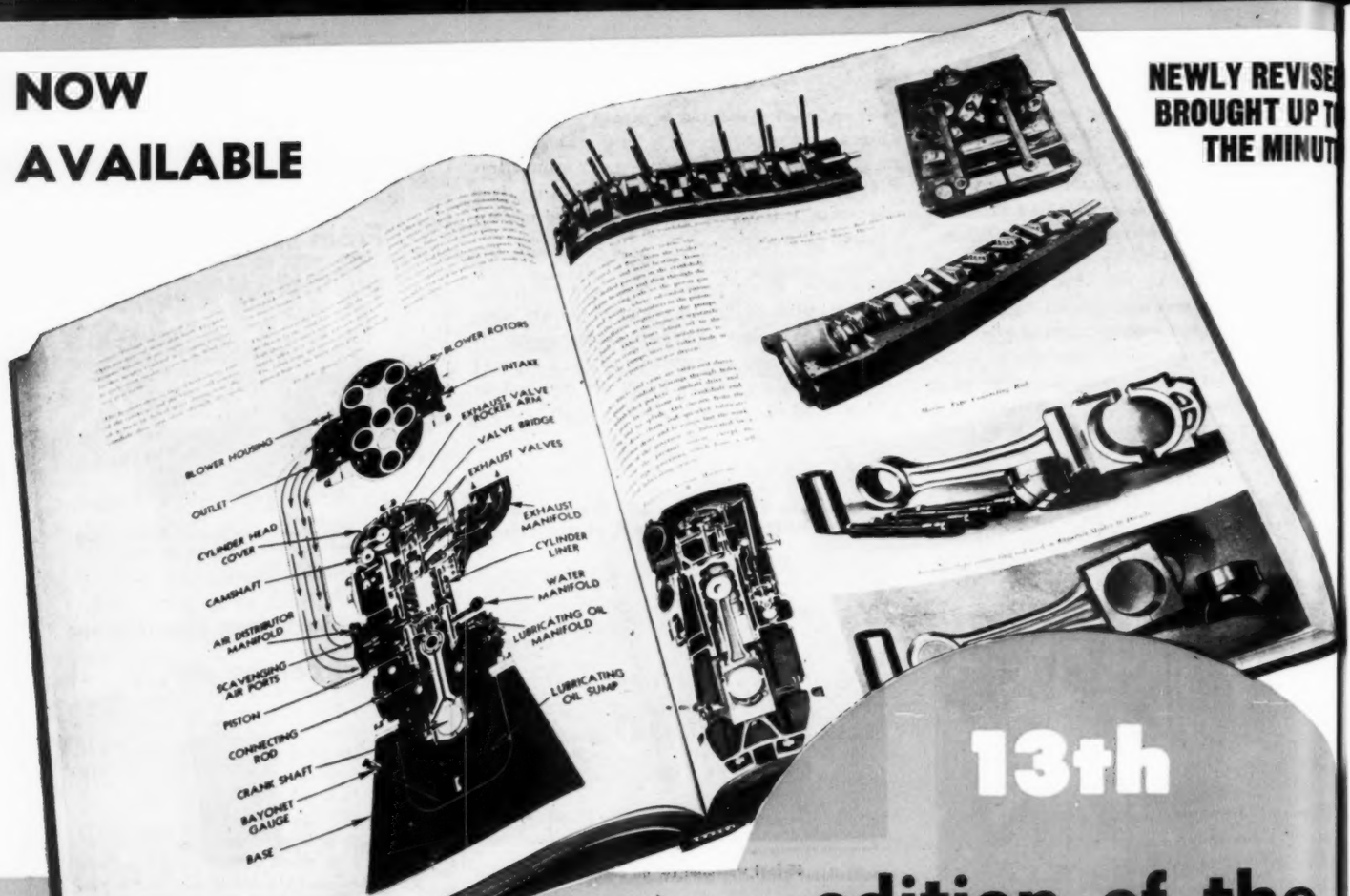

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Whatever you are looking for in diesel engines, or accessories, you will find them described and illustrated in the 1948 DIESEL ENGINE CATALOG, Volume 13, edited by Rex W. Wadman. What's more, you will find complete specifications on

840 DIFFERENT MODELS

The Products of 53 Engine Manufacturers. Each engine description is complete and accurate—checked and double-checked by the Manufacturer himself. Illustrations include full page engine views, lube and fuel system diagrams, also cooling systems—many traced in color. But that is just the Diesel engine section. The Catalog also includes an accessory section carrying valuable information on the various Fuel Injection Sytems, Gear and Chain Drives, Turbochargers, Blowers, all fully described and profusely illustrated.

FOR DESIGN AND OPERATING ENGINEERS AND BUYERS

There is a Market Place Section—a directory of Diesel engines classified as to ratings and speeds with manufacturers' names and addresses—and a Product Directory including accessories, parts, materials and services—all classified as to products. The Market Place tells you at a glance where to find what you want for your engine or plant.

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(Please Print)

Autocall Announces New "Single" Style Annunciator

FORMERLY built only in "double" style—with two columns of pilot lamps, reset switches, and designation windows—the "ANF" type of Annunciator has been redesigned by The Autocall Co. of Shelby, Ohio, to meet the demand for an Annunciator with the "ANF" operating features but with less width. This new "single" style of the "ANF" is one-half the width of its double style predecessors, and measures only 10" as compared with the 20" width of the double style. This reduction in width greatly facilitates installation in new or existing panel boards and control racks since it will occupy only one-half the room in width formerly required for the double style.

Autocall "Single" Annunciator

In actual operation, illumination of the designation windows is accomplished by the closing of a control relay actuated by a supervisory, or "trouble" contact on the equipment under supervision. At the instant of closure, and subsequent designation illumination, a remote audible alarm is sounded, which continues until the push-pull type switch adjacent to that particular designation is pulled. One of the features of the ANF (S), however, is the fact that silencing of the audible alarm for one trouble indication does not prevent the operation of the same audible alarm in the event of additional "trouble."

The illumination of the appropriate designation will continue until the equipment restores to normal and the "trouble" contacts open. Restoration to normal is signalled to the operator by means of the small pilot lamp immediately adjacent to, and between, the formerly illuminated designation and its companion reset switch.

A second audible alarm is an optional feature of the ANF(S). The ANF(S) will operate on any of the standard voltages, and may be furnished for either A.C. or D.C. operation. Further information regarding this and other types of Autocall Annunciators may be obtained by writing: The Autocall Company, Shelby, Ohio.

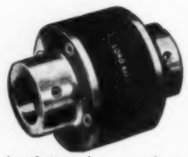
Drill Press Catalog

BOTH the bench and floor models of the new South Bend 14" precision drill presses are shown in a new catalog. Also illustrated and described are motors, controls, extra spindles, and other drill press accessories. Complete specifications and prices are listed. Diagrams are used to show all important dimensions of the drill presses.

A copy of catalog No. 400 may be obtained by writing to the South Bend Lathe Works, 358 East Madison Street, South Bend 22, Indiana.

Multiple H.P. Couplings

THE Lord Manufacturing Company of Erie, Pa. announces a new line of Multiple H.P. Couplings from 2 to 100 hp. at 1750 rpm. The complete line is now available in 17 sizes from 1/50 to 100 hp. at 1750 rpm. 1/50 to 15 hp. couplings have 15° torsional deflection under rated load. Sizes 30 to 100 hp. have 3°. It is claimed that this high deflection gives unusual vibration isolation. Couplings will accommodate at least 2° angular and 1/32" parallel misalignment. Neoprene flexing elements operate in shear and are bonded to steel plates. For complete information write Lord Manufacturing Company, Erie, Pa. and ask for Bulletin 201.



Lord 2-15 hp. coupling

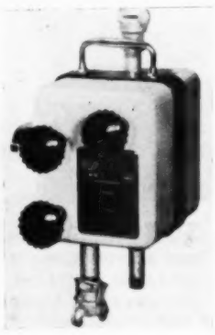
Air Filter Catalog

AIR-MAZE Corporation has recently released a new oil bath air filter catalog. Described therein are the new Air-Maze filters designed for air intake installation on engines, compressors and pressure blowers. Also included are tables for easy determination of the correct size of filter for any installation. The new models incorporate a number of advantages over the previous models. Extra rigidity of the filter element provided by heavy guard screen; New felt oil control ring for better sealing action between bowl and element: Better dust efficiency—97½%: Relief valves for larger units.

Copies of this bulletin may be had by writing Air-Maze Corporation, 5200 Harvard Avenue, Cleveland 5, Ohio.

Improved Steam Cleaning Unit Now Available

AN IMPROVED TURCO Hydro-Steam cleaning unit now is available. It incorporates, in a simple unit, features usually found only in expensive self-fired chemical spray cleaning machines.



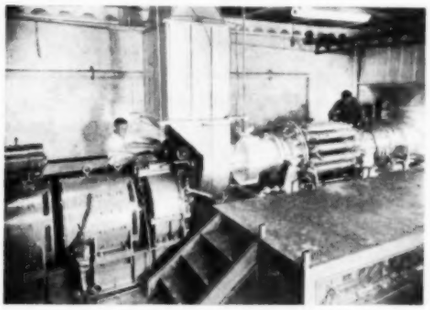
The Turco Hydro-steam unit is practical wherever a steam line pressure of 80 to 150 pounds is available. Weighing only 28 pounds, the unit is easily portable and may be quickly disconnected for removal to other parts of a plant.

Further information is available through Turco Products, Inc., 6135 South Central Avenue, Los Angeles 1, Calif.

Order Your Copy of the 1948 DIESEL ENGINE CATALOG, Vol. 13 now. Thoroughly revised — more complete — indispensable. Convenient order coupon on page 90 this issue. Mail it today.

Westinghouse Gas Turbine Goes Into Industrial Service

The same 2000-hp. combustion gas turbine that recently completed more than a thousand hours of test operation at the Westinghouse Turbine Division, Essington, Pa., is about to be shipped to the Mississippi River Fuel Corporation where it will go into service driving a compressor on the natural gas line between Monroe, La. and St. Louis, Mo.



Westinghouse 2000 hp gas turbine.

Arrangements have been made through the cooperation of Westinghouse, Mississippi River Fuel, and Ingersoll Rand for a six months trial beginning early in 1949. The gas turbine will drive an Ingersoll Rand centrifugal compressor at 8750 rpm. It will be modified to suit the application with a bed-plate for mounting all components including the compressor.

This is expected to be the first application of a mechanical drive combustion gas turbine in industry in this country. The gas turbine has many advantages which promise wide industrial and transportation use in the future. Producing more power per pound of weight than any other present day power plant, it requires only a simple, inexpensive concrete mat foundation and can be trucked into remote undeveloped regions. It can be set up and made ready to operate in a few hours. It needs no water and very little lubricating oil. Maintenance problems are minimized. In addition to this application, Westinghouse has plans for a gas turbine powered locomotive.

Golden Jubilee

A good idea for New York's 50 year Celebration which was suggested by Jim Barnaby of Worthington.

WEST COAST DIESEL NEWS

By FRED M. BURT

COASTAL TYPE freight vessels, 339 ft. *Check Knot* and the *Acorn Knot*, C1MAV1 Maritime Commission design, are being converted to Army Transports at Moore Drydock Co., Oakland yards —powered with 1700 hp. Busch-Sulzer diesels.

A NEW LIMA Shovel for Dragline Rentals, Long Beach, Calif. is powered with a Cummins 250 hp., 1,000 rpm. diesel engine.

THE NEW 10,000-TON *Selma Salen*, built for Sven Salen, Stockholm in Taranto, Italy, for service between Europe and the Pacific Coast is powered with a two-stroke, double-acting, seven cyl. Fiat diesel of 6,000 bhp., for a speed of 18 knots.

RECENTLY STEPPED UP to a departure every ten days, freight service by Alaska Freight Express Corp., of Juneau, Alaska; now in service, chartered from Ocean Tow, Inc., Seattle, eight, twin screw, wooden-hulled tugs, all Fairbanks-Morse diesel engine powered; five tugs with twin, 6 cyl. 690 hp. each; three with twin, 600 hp.

RADIO STATION KLAC of Los Angeles put their television unit into operation Sept. 17 with power supplied by a "Caterpillar" diesel-generating set; located on the top of Mt. Wilson.

A STOCK MODEL combination, 48 ft. steel welded boat, designed by Ed Monk and Lorne Garden, Seattle, is under construction by Birchfield Boiler, Inc., Tacoma, to be powered with a 165 hp. General Motors diesel engine.

SEVERAL 36-FT. RAMP TYPE U. S. Landing barges, converted into logging camp tenders by Burrard Shipyard and Engineering Wks., Vancouver, for Skeena Lumber Co., British Columbia, with new bows and six feet added length; powered with a 225 hp. single screw Gray diesel, attain speed of 16 knots.

THE KING-KNIGHT CO., San Francisco, Lyman S. King, Pres. has been reappointed northern California distributor for Buda automotive, industrial and marine engines; the sales organization is being augmented with sub-dealers appointed in strategic locations.

POWERED WITH a 250 hp. Atlas diesel, big purse seiner *Paolina T.* is being overhauled at the yards of W. F. Stone & Son, Alameda.

REVISED TO specifications of Capt. "Slim" A. Leppaluoto of Inland Navigation Co., for a survey vessel and tug, the *Frances,* former 114 ft. Army FS, is powered with a twin Atlas diesel engine, 320 hp. each; with two Hercules, 6 cyl. 20 kw. diesel-generating sets for auxiliaries.

WORK BOATS, 40 ft. *Skagit* and *Diablo II,* built for Seattle City Light by Commercial Ship Repair, Winslow, Wash., for work at dams and lakes on upper Skagit River, are powered with "Caterpillar diesel engines, with Western Gears.

FOR BELL and Burton, a Whirlwind drilling rig, draw works, from Bethlehem Supply Co., Los Angeles, is powered with four Waukesha, 190 hp. diesel engines, two for the draw works, two for the mud pumps.

A FORTY FT. NINE IN., heavy-duty diesel cruiser, designed by B. F. Jensen, Seattle, for Dr. Frank Russell, Orcas, Wash., being built by Albert Jensen & Sons, Orcas, will be powered with a 43 hp., 4 cyl. "Caterpillar" diesel.

A NEW TUG for Willamette Tug and Barge Co., being outfitted by Albina Engine & Machine Works, Portland, Ore., hull purchased from the Navy, will be powered with a 500 hp. General Motors diesel engine.

THE AMERICAN Broadcasting Co., television station, one of eight now in operation close to the famed observatory on Mt. Wilson, near Los Angeles, has been powered with a General Motors 71 series, 6 cyl. 160 hp., 100 kw. diesel-generating set; installation by Austin Engineering Co., Los Angeles, California.

THE 62 FT. *Adventure,* built by Grandy Boat Co., Seattle, for Otis Harlan, Seattle, one of the West Coast's largest cruisers, is powered with twin General Motors, 165 hp. diesel engines.

POWERED WITH a 330 hp. Washington diesel, is the *Conqueror,* 87 ft. wooden tuna clipper, designed by Art De Fever, being built by Tacoma Boat Bldg. Co.

SUPPLIED TO Ernest Hawse (1), Higley Farms (2), and J. Sassman (1), Superior, 6G510 300 hp., 6 cyl. at 900 rpm., natural gas engines, connected to right angle gear heads to drive deep well pumps for Arizona irrigation; through State Tractor & Equip Co., Phoenix.

WYOMING, cannery tender operating for Ketchikan Packing Co., has been re-powered with a 150 hp. Lorimer diesel engine by the Mathers Co.

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